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FROM VIETNAM TO BEYOND THE COLD WAR: THE EVOLUTION OF U.S. ARMY ENGINEER FORCES, 1973-1991

by

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The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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Abstract of
FROM VIETNAM TO BEYOND THE COLD WAR. THE EVOLUTION OF U.S. ARMY ENGINEER FORCES, 1973-1991

This study describes and analyzes the evolution of force structure and organizational focus within the troop side of the U.S. Army Corps of Engineers from the end of the Vietnam War through today. The purpose is to understand what changes have taken place, why they occurred, and what the future implications of these changes are in the post-Cold War security environment. The scope of the study is limited primarily to US Army combat and construction engineer forces. From the end of the Vietnam War to the end of the Cold War, the Engineers have changed their force structure and organizational focus from essentially a construction orientation to a predominantly combat engineering, or sapper, focus. From WWII through the end of Vietnam, the Army's major requirement for the Engineers was construction. After Vietnam however, a number of important Army changes caused the relative value of combat engineering to increase, while the perceived need for construction forces dropped. As a result of this changed environment, today's Engineers are better prepared than ever to provide close combat tactical support for maneuver forces, but have lost much of their construction capability, a diminishing operational asset which will play an increasingly important role in both regional wars and peacetime engagement.

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LIST OF ABBREVIATED TERMS

AC	Active Component
ACE	Armored Combat Earthmover
CMV	Combat Mobility Vehicle
CSE	Combat Support Equipment (company)
DEH	Directorate of Engineering and Housing
EAC	Echelons Above Corps
ERI	Engineer Restructure Initiative
MOS	Military Occupation Specialty
NTC	National Training Center
PE	Peacetime Engagement
RC	Reserve Component
USACE	US Army Corps of Engineers

FROM VIETNAM TO BEYOND THE COLD WAR: THE EVOLUTION OF US ARMY ENGINEER FORCES, 1973-1991

CHAPTER I

INTRODUCTION

The Problem.

Since the end of the Vietnam War, US Army active component (AC) engineer forces have undergone the most fundamental and significant restructuring since World War One (WWI.) Although the Engineers are a critical member of the Army's combined arms team, and play a crucial role at the tactical, operational and strategic levels of war, this transformation--along with its causes and consequences--has not been analyzed comprehensively. Thus there is a gap in both the historical and contemporary literature on the Engineers, even as force planners wrestle with the complexities of redesigning the American Army for the new world order. This study seeks to bridge the gap by describing the transformation of American engineer forces since Vietnam, anlyzing the factors which caused the transformation, and assessing the implications of engineer force structure now that the Cold War is over.

Thesis

Since Vietnam, the organizational structure and focus of AC engineer forces have shifted decidedly away from construction in favor of the divisional close combat, or sapper, role. My thesis is that the resurgence

of the sappers is an organizational response by the Engineers to external demands brought on by a shift in the nation's strategic focus, and by changes in the Army's doctrine, training and internal politics. These external demands caused the relative importance of the sapper role to rise, and the perceived importance of construction to decrease, which in turn spurred the Engineers to transform themselves.

The resurgence of the sappers was also facilitated by a strong organizational culture which dates back to the birth of America's combat engineers in 1775. Although the Engineers have adopted a broad array of technical support missions since their founding (i.e. nation building, topographic engineering, construction, etc.), they see their primary mission as providing close combat support to maneuver forces. Engineer elites have always considered themselves warriors and eagerly reestablished the sapper role as the core mission of the organization.

The sapper focus will dramatically improve the Engineers' tactical support to maneuver forces, however the decline in AC construction capability presents a risk that could constrain the Army in the future. Construction forces are especially valuable in building infrastructure in areas that are remote, hostile, or both. This mission promises to take on increased importance--both in regional conflicts and peacetime engagement--in the post-Cold War era. Unless the Army increases its AC construction forces, it will have to rely more heavily on the Reserve Component (RC) and the construction contracting capability of the U.S. Army Corps of Engineers (USACE.)

Overview of Engineer Organization and Roles

Before delving into the research findings and analysis, it is useful to examine where engineer forces fit into the Corps of Engineers, the roles and missions of engineer forces, and how they are organized.

The Corps of Engineers is a large, complex collection of organizations with a diverse set of missions. Refered to as "the engineer family" by the Chief of Engineers, the Corps includes more than 100,000 engineer soldiers, some 70 percent of whom are in the Reserve Component, who provide combat support to operational Army field forces; 50,000 civilians, led by engineer officers, who maintain and manage Army real property and serve as the Army's "city engineers" in supporting installation commanders in the directorates of engineering and housing (DEHs); and another 43,000 civilians, again led by engineer officers, who comprise the US Army Corps of Engineers (USACE), a major Army command which provides Congressionally appropriated military construction, civil works support to the nation, research and development, and engineering support to a variety of government agencies. Specializing in contract construction, USACE employs hundreds of thousands of civilian contractor employees who perform most of the design and construction for the Army.[1]

Until Secretary of Defense Robert McNamara reorganized the Department of the Army in 1962, the Chief of Engineers--a lieutenant general--had command authority over the entire Corps of Engineers. Moreover, he was responsible for the management and training of all engineer personnel, and the procurement of all engineer materiel. Although the Chief continues to exercise considerable power and is still

seen as the "father of the engineer family," his actual authority was sharply curtailed in the 1962 reorganization. The Engineer School, which is responsible for training engineer soldiers and officers, developing doctrine, and identifying materiel requirements, was taken away from the Chief of Engineers and placed under the same centralized command as the Army's other branch schools. As a result, the Commandant of the Engineer School--an engineer major general--works not for the Chief of Engineers, but rather for the Commander of the Army Training and Doctrine Command. Likewise, procurement of equipment and materiel for engineer troops was shifted to an Army-wide procurement agency known as the Army Materiel Command. Although the Chief of Engineers provides technical and budget programming support to the DEHs, these organizations work directly for the Army's installation commanders. The Chief has however, exercised command authority over USACE since 1979, when the Army elevated the status of that organization to a major Army command.[2] Although both the USACE and DEH organizations play important roles in supporting the Army, this study will focus on the troop side of the Corps.

Before analyzing the roles of engineer forces and how they are organized, one should first understand that the fundamental purpose of US Army engineer forces is to provide engineer support for the American Army, an organization which is charged to deter, and if necessary fight and win the nation's wars. Within that purpose, the overarching role of engineer forces is to "turn terrain into an asset for our forces and a weapon against the enemy . . ." and to "multiply the effectiveness of friendly forces."[3] Engineer troops do not normally destroy the enemy directly. Rather, by modifying the terrain of the battlefield and theater of

operations, they multiply the effectiveness of the friendly forces whose primary purpose is to maneuver and destroy the enemy by fire. In short, engineers apply their knowledge and technical skills to help destroy the enemy.

Functional Roles. Engineer missions are grouped into five functional roles: mobility, countermobility, survivability, sustainment engineering, and topographic engineering.[4]

The engineers' mobility role "frees the commander from movement limitations imposed by natural terrain or enemy action, to allow maneuver of tactical units into positions of advan'age."[5] Mobility allows the maneuver commander to move where and when he wants. In the attack, engineers move with the leading combat elements to clear obstacles quickly, to bridge gaps and rivers, and to reduce fortifications that impede the maneuver of friendly forces. Engineers also conduct terrain and route reconnaissance, recommend the best routes to the maneuver commander, and then upgrade and maintain the routes as necessary. Finally, engineers construct and maintain landing sites for Army aviation and Air Force units.[6] The mobility role dictates the use of divisional combat engineers as assault troops out in front of the attacking infantry and armor units they support.

The countermobility role "directly attacks the enemy commander's ability to execute his plan where and when he desires."[7] Working within the intent of the maneuver commander's plan, engineers strive to modify the natural terrain with man-made obstacles in order to impede the maneuverability of enemy forces. By slowing, disrupting, turning, blocking, or fixing the enemy, the engineers make him more vulnerable to

the effects of friendly firepower.[8] When performing countermobility missions, engineers are often well forward and may be the first to engage attacking enemy forces. They also emplace most of the mines found on the battlefield--the one engineer obstacle that is intended to kill enemy forces directly.

Though every soldier is responsible for protecting himself, the engineers' survivability role "allows friendly forces to fight from locations that would otherwise be untenable" and "provides concealment and protective shelter from the effects of enemy weapons."[9] Using their technical know-how and specialized equipment, engineers improve fighting positions, build fortifications, harden facilities in the rear area, and assist with camouflage operations. They also help construct nuclear-biological-chemical (NBC) decontamination points, and assist in decontaminating routes and friendly areas.[10]

Sustainment engineering, or general engineering support, "adds depth in space and time to the battle by ensuring that sustainment operations can occur."[11] Engineers construct support facilities in the rear area, build and maintain lines of communication (LOCs), repair damage to airfields and other key facilities, and perform whatever construction tasks are necessary to ensure that the forward forces can be logistically supported and sustained in combat. The intensity and type of tasks performed depends upon the number of committed forces, the state of the theater's infrastructure, the level of host-nation support, and the intensity level of the conflict.[12]

The final engineer role, topographic engineering, "defines and delineates the terrain for planning and operations, and provides precise

location data to weapons systems."[13] Put simply, it "provides commanders with information about terrain."[14] In their role as "terrain managers," all engineers conduct detailed terrain analysis and reconnaissance; and recommend routes, obstacle sites, kill zones, locations for friendly positions, and deep area targets to the maneuver commander. More specialized topographic engineer units produce maps, digital terrain data, and other terrain analysis products to assist maneuver commanders in using the ground most effectively.[15]

Organization of Engineer Forces. To execute their missions, engineer troops are organized into combat, construction and topographic units. These engineer companies, battalions and brigades are then integrated into the Army's divisions, corps, and theater armies, and serve throughout the depth of the theater of operations.

Combat engineers are organized into divisional and corps combat battalions. Divisional combat engineer battalions are "organic" to the division and are a fundamental, or indivisible, part of divisional force structure. These units are comprised mainly of "sapper" specialists and concentrate on providing close support to infantry and armor units by performing mobility, countermobility and survivability missions at the forward edge of the battlefield.

Corps combat battalions--also comprised predominantly of sappers--reinforce the divisional battalions by performing the mobility, countermobility and survivability missions from the rear of the forward maneuver brigades to the corps rear area. Assisting the corps combat battalions are heavy bridge units, and combat support equipment companies which have significant earthmoving capability.

Renamed "combat heavy battalions" in 1975, construction battalions are found in both corps and theater army engineer brigades. Made up of soldiers who are trained in construction specialties, they generally work in the corps and theater rear areas performing sustainment engineering missions--typically some kind of construction--although their heavy earthmoving platoons are sometimes sent forward to assist divisional or corps engineers in countermobility and survivability missions.

Topographic engineer units are comprised of topographic specialists who perform technical missions such as map reproduction and terrain analysis. Although topographic teams are found on division staffs, topographic battalions are located at corps or theater level.[16] For the remainder of this paper, topographic units will not be discussed.

Engineers and the Elements of Combat Power. Army doctrine recognizes four dynamic elements of combat power: maneuver, firepower, protection and leadership.[17] Engineer forces and the missions they perform are intimately involved in transforming the first three of these elements from theory into reality on the battlefield.

Maneuver is defined as "the movement of forces in relation to the enemy to secure or retain positional advantage."[18] Because maneuver depends on mobility, engineers are crucial in enabling friendly forces to maneuver. Divisional engineers in particular must be organized, equipped and trained to move with infantry and armor forces in order to analyze terrain, rapidly overcome both natural and man-made obstacles, and emplace obstacles to limit the maneuver of enemy forces.[19]

Firepower, the second element of combat power, "provides the destructive force essential to defeating the enemy's ability and will to

fight."[20] In practical terms, commanders apply this element of combat power by positioning their weapons to concentrate mass fires on enemy targets. Although engineers may destroy enemy forces directly with mines, demolitions, and their own weapons, their main role is to emplace obstacle systems which disrupt enemy formations, force the enemy into engagement areas and kill zones, and hold him in place. By modifying the terrain, engineers help create lucrative targets and prolong the enemy's exposure to friendly firepower. By analyzing the terrain prior to the battle and determining likely enemy routes, engineers also help plan and select kill zones.[21]

The third element of combat power is protection, which the Army defines as "the conservation of the fighting potential of a force so that it can be applied at the decisive time and place."[22] Protection of friendly forces makes it more difficult for the enemy to locate and attack them. Actions to protect the force include cover, concealment, and deception. Engineers play a major role in protecting the friendly forces by building fortifications, bunkers, shelters, weapons emplacements and vehicle fighting positions. These terrain enhancements not only help friendly forces survive, they also enable them to fight from more advantageous positions that would otherwise be too vulnerable to enemy firepower. Finally, engineers help camouflage friendly forces and also contribute to the maneuver commander's deception plan by constructing false fighting positions and facilities to confuse the enemy.[23]

In a Clausewitzian sense, engineers are in the business of both creating and reducing "friction."[24] Moreover, the engineer must, as Clausewitz says "fight at the right place and the right time."[25] To be

effective, engineers--and especially divisional sappers--must "synchronize" their efforts with the other members of the combined arms team.[26] In other words, if engineers perform their missions at the wrong place or time, the results will be useless at best and possibly disastrous.[27]

Scope and Structure of Paper

This study looks primarily at changes in US Army Engineer organization and focus since Vietnam, and the implications of these changes for the post-Cold War era. It does not consider the engineer forces of the other US services. In order to better understand the present and plan more effectively for the future however, one should first understand the Engineers' history.

The analysis begins in Chapter II with an historical overview of military engineering, and how changes in technology and the art of war have affected engineer forces. Chapter III traces the evolution of American engineer forces from the Revolutionary War through the War in Vietnam. It analyzes how the changing needs of the Army and the nation generated new engineer missions, which in turn led to changes in the organization and culture of the Engineers.

Chapter IV--the heart of the paper--provides an in-depth analysis and description of the rise of the sappers within the post-Vietnam Army. The implications of these developments for the Post-Cold War security environment are then analyzed in Chapter V. Finally, Chapter VI synthesizes all of the analysis and draws conclusions from the evidence.

ENDNOTES

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2. For more information on the breakup of the Engineers (as well as the Army's other technical branches) and the centralization of authority in the US Army, see. Charles Hendricks, "Changing Military Responsibilities and Relationships," an unpublished paper obtained from the History Office, Corps of Engineers, dated 14 June 1989, History Office, Chief of Engineers, The History of the US Army Corps of Engineers (Washington DC. US Army Corps of Engineers, 1986); Engineer Memoirs, LTG Walter K. Wilson, Jr. (Washington DC: Corps of Engineers, 1984); Department of the Army, Report on the Reorganization of the Army, (Washington DC: December 1961); James E. Hewes, From Root to McNamara: Army Organization and Administration, 1900-1963 (Washington DC: US Government Printing Office, 1975); and Russell F. Weigley, History of the United States Army (Bloomington. Indiana University Press, 1984).

3. US Department of the Army, Field Manual 5-100, Engineer Combat Operations (Washington DC. US Government Printing Office, November 1988), p. 3. Hereafter, this source is referred to as FM 5-100.

4. Ibid.

5. Ibid., p. iii.

6. Ibid., pp. 9-10. For more information on the Engineers' mobility role, see US Department of the Army, Field Manual 5-101, Mobility (Washington DC: US Government Printing Office, January 1985).

7. FM 5-100, p. iii.

8. Ibid., p. 10. For more information on the Engineers' coutermobility role, see Headquarters, Department of the Army, Field Manual 5-102, Countermobility (Washington DC: US Government Printing Office, March 1985).

9. FM 5-100, p. iii, 10.

10. Ibid., p. 10. For more information on the Engineers' survivability role, see US Department of the Army, Field Manual 5-103, Survivability (Washington DC. US Government Printing Office, June 1985).

11. FM 5-100, p. iii.

12. Ibid., p. 10. For more information on the sustainment engineering role, see US Department of the Army, Field Manual 5-104, General Engineering (Washington DC: US Government Printing Office, November 1986).

13. FM 5-100, p. iii.

14. Ibid., p. 10.

15. Ibid., p. 10. For more information on the topographic engineering role, see Headquarters, Department of the Army, Field Manual 5-105, Topographic Engineering (Washington DC: US Government Printing Office).

16. This entire section on "organization" is based on personal experience and knowledge gained as an engineer officer. For more detail, see FM 5-100.

17. US Department of the Army, Field Manual 100-5, Operations (Washington DC: US Government Printing Office, May 1986), p. 11. Hereafter, this source is referred to as FM 100-5.

18. Ibid., p. 12.

19. FM 5-100, p. 6.

20. FM 100-5, p. 12.

21. FM 5-100, p. 6.

22. FM 100-5, p. 13.

23. FM 5-100, p. 6.

24. For a discussion of "friction" in war, see Carl Von Clausewitz, On War, translated by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984), pp.119-121.

25. Ibid., p. 95.

26. The Army defines synchronization as the "arrangement of battlefield activities in time, space and purpose to produce maximum relative combat power at the decisive point." See FM 100-5, p. 17.

27. For a discussion of the difficulties of synchronizing engineer efforts with the combined arms team, see Dominic Izzo, "Wehrmacht Combat Engineer Doctrine and Organization," Unpublished Research Paper, US Naval War College, Newport RI: June 1991, pp. 10-12.

CHAPTER II

HISTORICAL ROLE OF MILITARY ENGINEERS

Throughout history, military engineers have played an important role in warfare. The culture and organization of American engineer forces have evolved from this historical legacy. To more fully understand American engineer forces, one should know something of their ancestors. This chapter presents a brief historical review of the evolution of military engineer forces.

Ancient and Medieval Times.

In its most basic form, combat engineering has descended from siegecraft, which consisted of defending military positions, fortresses and cities, as well as the means of overcoming these defenses.[1] The first fortifications, built and breached long before recorded history, were simple barriers such as ditches or walls. As civilization developed, so too did military engineering. Many great works of military engineering, built thousands of years ago, still stand as monuments to earlier empires. The Great Wall of China, for example, built more than two-thousand years ago, served as the core of an elaborate defensive system that served its purpose for more than a thousand years until Jenghiz Khan successfully breached the system and invaded China.[2]

The ancient Greeks built walls around their cities to defend themselves against attackers. As Thucydides recounts, it was generally too costly for the attacker to directly assault a walled city, so the

strategy was to lay siege to the city and try to starve the defenders into submission.[3] In the fourth century B.C., Alexander the Great learned to master a newly created technology called the torsion catapult. This machine enabled the attacker to launch more intensive, longer-range barrages that broke down enemy defenses and provided cover for the sappers to advance on and assault the fortification. By reducing the fear of devestating losses, Alexander "revealed himself as a master of siegecraft" and "pressed his sieges home with fiery and resourceful determination" as he conquered the Persian Empire.[4] Greek sappers were an important part of Alexander's army and played a key role in his success.

In a sense, the history of military engineering reflects the evolution of warfare itself. Over time, the attacker and the defender have continuously sought to develop and exploit new technology and tactics in order to gain the upper hand. As soon as the attacker discovered some new measure to overcome the advantages of the defender, the defender would take some appropriate countermeasure. Thus warfare, due in large part to the evolution of military engineering, can be seen as a continuous cycle of competition between the offense and the defense.[5]

The Roman Empire relied heavily on its military engineers, who were masters of both siegecraft and civil engineering. At the tactical level, every legionairre was both a combat engineer and an infantryman. He carried tools for building as well as for fighting. Constructing roads and fortifications were an integral part of his daily life and of the legions' tactical battle plans. At the strategic level, the Empire defended itself through a combination of political, diplomatic and

military means. The core of the military strategy was a highly mobile army which could deploy quickly to the farthest reaches of the Empire to supress any rebellion or attack. An elaborate transportation network, interconnected with forts and supply bases, gave Rome the capability to deploy its forces rapidly. This physical infrastructure also served as a deterrent. Visible for all to see, it was tangible evidence that Rome had both the capability and willingness to use force if need be.[6]

Leaping ahead to the middle ages, we see that the engineers' role continued to increase. In Medieval times, landowners constructed castles in order to assure the protection of their lands. These castles represented both symbolic and actual strength and power. Relatively minor barons could successfully exercise control of their territory from the safety of their impregnable castles, which were strategically located and constructed to withstand attack. Medieval wars tended to be straightforward struggles for the possession of these castles. The only means available to the attacker were such antique devices as the catapult, the battering ram, the escalade, and, of course, starving out the inhabitants of the castle.[7] The defender, safe inside the castle walls, had a great advantage over the attacker.

<u>The Modern Era</u>.

Technology changed this however, when the French developed the use of siege artillery in the 15th Century. With the new cannon, the attacker was able to shatter the castle walls. The end of the era of castle dominance was most vividly symbolized when Turkish artillery destroyed the walls of Constantinople during this period. The high but relatively

thin walls of medieval castles, built to resist scaling and provide a commanding view of the surrounding countryside, were now pathetically vulnerable to cannon balls.[8]

As always in the evolution of warfare, the defender learned to adjust. The answer was to counter the attacker's fire with fire of their own, and to provide a defense in depth. As Machiavelli wrote, "Our first care is to make our walls crooked and retort, with several vaults and places of receipt, that if the enemy attempts to approach, he may be opposed and repulsed as well in the flank as in the front."[9]

This concept led engineers to begin constructing mutually supporting bastions which projected out from the walls in such a manner as to allow the defender to fire upon both the rear and flank against an assault on either the walls or the bastion. Known as the "bastioned trace," this new concept in fortifications also included lower walls to present a smaller target to the attacker, internal earthwork reinforcements, a moat around the fortress, and beyond the moat, a smooth glacis which exposed the attacker to concentrated and sweeping fires.[10]

Engineers of the Italian city states first devised this new type of fortification in the 1490's, and, over the next fifty years, these forts were built all over Europe. While essential for military security, they were also a matter of civic pride. The scope of these new defensive systems also expanded from local and tactical to continuous and strategic. This system of continuous fortified frontiers was perfected by Vauban in 17th Century France and Coehorn in the Netherlands. Fortresses of this period could neither be conquered by assault nor

bypassed, since the lines of communication of the bypassing army would then be subject to attack by forces garrisoned within the fortress. The attacker had two choices, either to invest the fortress, or mask it by detaching part of his main force to guard against attacks on his supply convoys. Neither of these were especially attractive options, as investing the fortress was extremely time consuming, and masking it weakened the main force.[11]

Just as the defender developed this new system of fortification to offset the attacker's recently found advantage in siege artillery, so the attacker now developed a new form of warfare to overcome the defender's advantage. The next round of innovation in siegecraft emphasized engineers in the offense, and was developed by Italian engineers during the Italian Wars of the early 16th Century. It consisted of the following basic elements. First, the attacker would surround the fortress and dig a continuous line of trenches just beyond the range of the defender's guns. From this initial trench line, zig-zag trenches (called "saps") were extended to the edge of the enemy's glacis at angles sufficiently wide to protect the assaulting sappers from the defender's fire. The trenches also concealed a series of firing batteries along the extended line. From the edge of the glacis, sappers would dig mines underneath the fortifications and fill the mines with explosives. At the same time, the defender would be countering the attacker's mines with mines of their own. After weeks of sapping and skirmishing in these trenches, this work would come to a climax when the attacker would unmask his concealed artillery batteries, simultaneously concentrate his

fires at the selected breach point, detonate the explosives in the mines, and launch the assault.

Dirty, dangerous and tedious, siegecraft dominated European warfare for more than two hundred years During this period, the defense was dominant, and warfare tended to be prolonged and indecisive.[12] Throughout this era of warfare, the military engineer was a dominant figure in strategic and tactical planning and the sappers played an important and dangerous role in land warfare, working hand-in-hand with the artillery and infantry.

By the 18th Century, war in Europe was conducted by professional armed forces similar to those we know today. For the first time in history, the military profession became separate and distinct from civilian society. In return for a loyal career of serivce, the state offered the officers of these professional forces regular employment and wages. At the end of the century these armies were concerned primarily with fortifications and siegecraft, marches and supply.[13]

All of this soon changed. The confluence of several innovations--organized state bureaucracy, the organization of armies into divisions, and the rise of nationalistic armies in which the entire nation bore arms --dramatically altered warfare in the 19th Century. The sheer size and ferocity of Napoleon's army rendered the previous methods of fortifications and siegecraft virually obsolete. Napoleon's strategy was to mass huge numbers of troops at decisive points, as opposed to sieging each and every fortress along the way. His armies learned to forage off the land rather than depend upon lines of communication for their

supplies. They quickly learned that as long as the army remained on the move it could feed itself. Survival depended on maneuver.[14]

Shortly after Napoleon had transformed warfare from the art and science of siegecraft to one of movement, the development of the steam engine and the railroad in the mid 19th Century dramatically enhanced the ability of armies to move large distances rapidly and arrive fresh for battle. Combined with the innovation of the telegraph and the development of general staffs who learned to effectively control and administer the movement of huge armies by rail, the railroad spurred major changes in strategy and made mass armies a practical and flexible military tool.[15]

As new developments in transportation technology changed strategy, so too did the innovation of rifled weapons and high explosives cause tactics to change. The accuracy and range of weaponry made the battlefield far more lethal, and the increase in available firepower gave a force defending from dug-in positions a tremendous advantage over the attacker.[16] First seen in the Crimean War, the new tactic placed individual soldiers inside pits (now known as foxholes) that were protected by sandbags. Eventually, the defenders connected the pits with trenches.[17] In planning and executing these tactics, the engineer was a key participant in the selection and preparation of the terrain, particularly on the defense. Combined with the deadly new firepower available, field fortifications became much more extensive than ever before, and once again became one of the main occupations of armies.[18]

Until these lessons were learned in blood, the early battles of the American Civil War tended to be pure and simple fire fights. By 1862

however, both the Northern and Southern forces routinely constructed hasty field fortifications and barriers. Early on, the shovel was recognized as more important than the bayonette, as soldiers dug pits, connected them with trenches, built log barricades and fortified them with earth for protection. Like the trenches and barbed wire of WWI, these field works protected the defender and impeded the mobility of the attacker.[19]

Combined with the Civil War, the Russo-Japanese War should have convinced European military planners of the new realities of the modern battlefield, but the lessons went unlearned. As a consequence, the armies of Europe entered WWI under the belief that the offense reigned supreme, and that the spirit of the attack could overcome opposing forces defending from fortified positions and armed with modern weapons. The ensuing slaughter finally made believers of the generals. On the Western Front, trenches reinforced with barbed wire and concrete took away any possibility of one side outflanking the other, and the war became one of bloody attrition.[20] The repeating rifle, rapid-fire artillery, and the machine gun--all brought to a new level with the development of smokeless powder--gave an even greater advantage to the defender during WWI. New inventions like the tank, the airplane, the automobile and the radio would transform the battlefield late in the war, but their effects were not fully realized until World War Two (WWII.)[21] WWI's combination of industrialized warfare and static trench fighting required more engineer troops than ever before. From sapper work at the front to building infrastructure in the rear, the level of engineer effort was unprecedented.

The Treaty of Versailles denied the Germans any possibility of constructing border defenses or building a mass army. As a result, the German Army turned toward mechanization and developed the *blitzkrieg* style of warfare. The French on the other hand, traumatized by the losses of WWI and the failure of their offensive strategy, developed a defensive strategy and constructed the Maginot Line as the heart of their defense. While both strategies were sound in concept, the fall of France in 1940 demonstrated the superiority of German execution. Utilized as a combat arm in the attack, German combat engineers were integrated into armor and infantry formations. They were considered a full-fledged member of the combined arms team and played a major role in the German victories.[22]

America's experience in WWII was one of unprecedented requirements for the construction of transportation and logistical infrastructure to support an Army deployed vast distances and that relied on mechanization, motorization and heavy firepower. The Korean and Vietnam Wars reinforced these ideas. The US Army realized that construction had become a major operational constraint on its ability to accomplish its wartime mission. As a result, the importance of construction forces was recognized and their numbers in the American Army increased.[23]

The Effect of Historical Change on Today's Military Engineers.

Significant changes in the modern role of military engineers were first brought on by the genius of Napoleon and the technology of the industrial revolution. On the one hand, permanent fortification and

deliberate siegecraft were no longer the essence of land warfare. As a result, engineers no longer dominated strategic thought as they had in the 17th and 18th centuries. In terms of prestige and influence, the engineers entered an era of relative decline while the infantry, cavalry and artillery arms of service began to rise. On the other hand, the engineers' mobility and field fortification missions and their role in building and maintaining transportation infrastructure began to grow and increase in importance. This infrastructure role however, fell more into the area of logistical support, and was not as prestigious or glamorous as defending and siezing permanent fortifications.

As technology has changed and armies have grown larger, the art and science of maneuvering and supplying armies has steadily evolved. This evolution has in turn resulted in significant changes in the missions and organization of the engineers. We can see a general trend of ever larger armies moving more supplies at a faster rate. Looking at the means of transportation employed, three distinct periods are evident. First was the age of the horse-drawn wagon, which was superceded by the railway in the 19th Century. In the 20th Century, motorized trucks have superceded the railway.[24] This trend has caused the number of engineer troops and the importance of their construction role to increase dramatically.

Up until WWI, it was easier to supply an army on the move than one that was standing still. This was because the vast majority of items that an army needed to sustain itself were taken from the land. As late as 1870, subsistence items (food and fodder) accounted for more than 90 percent of all supplies, with industrial supplies such as ammunition

making up the remainder. With the advent of industrial war in the 20th Century, this proportion was reversed, and with this reversal it became harder to supply a moving than a stationary army. A modern 20th Century army depends upon an industrial base from which it must draw its ammunition, petroleum products and equipment. The further an army moves from its industrial base the more difficult it is to sustain. During the two world wars, strategy in effect became an appendix of logistics.[25] This fundamental change in warfare pushed military engineers from purely tactical functions into the logistical arena.

Both the trench warfare of WWI and the rapid movement of WWII demanded greater numbers of combat engineers than ever before to support the combat arms. The sappers became an increasingly important combat branch. However, the industrialized nature of the wars caused a huge increase in logistical consumption and demanded unprecedented engineer effort in building and maintaining transportation infrastructure. The importance and scope of this role--particularly in the expeditionary-focussed United States Army--demanded construction engineer troops on a scale never seen before and made them a crucial technical support branch.

ENDNOTES

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CHAPTER III

FROM THE REVOLUTIONARY WAR TO VIETNAM: A BRIEF HISTORY OF US ARMY ENGINEER FORCES

Having reviewed the historical role of military engineers, let us now turn to the evolution of the US Army's engineer forces. The chapter will briefly review the history of the American engineers from their birth during the Revolutionary War through the War in Vietnam. It will also provide background on the cultural trends which influence the way the Engineers behave today and the choices they make.

Founding and Early Days, 1775-1801.

The Corps of Engineers traces its origins to June 16, 1775 during the Revolutionary War and the birth of the nation. Because military engineers were crucial to success in war, the Continental Congress authorized a "Chief Engineer" and "two assistants" in General Washington's new army.[1] The Chief's first mission was to direct the design and construction of the fortifications in and around Boston. These fortifications played an important role in the British decision to evacuate Boston in March 1776.[2] As the war expanded, the requirements for military engineering became greater, and with the dearth of trained engineers in America, GEN Washington turned to Europe for assistance. Most of his engineers came from France, where the art and science of military engineering had flowered.[3]

On May 27, 1778, Congress authorized the formation of three companies of "sappers and miners," the Army's first engineer troop units,

and on March 11, 1779, the Congress formally established the Corps of Engineers, which included the Chief and his assistants, as well as the engineer troops. The Corps' most notable achievement during the war was the successful siege of the British defenses at Yorktown in October 1781. Although Congress disbanded the Corps on November 3, 1783, the Corps' original role as an organization of combat engineers supporting the Army in battle would be the foundation of its organizational culture.[4]

During the 18th Century, the realm of military engineering was confined to the science of fortification and siegecraft, with other branches responsible for many of the roles that now belong to the Engineers. The construction of roads and cantonments was the responsibility of the Quartermaster General, and the Geographer of the Army was responsible for mapping and surveying.[5]

In March of 1794, with relations deteriorating between the US and the European powers, and in response to President Washington's request, Congress authorized funds to fortify key harbors. As during the Revolution, virtually all of the engineers who served with US forces were foreigners.[6] With Great Britain again threatening war, Congress authorized the creation of a "Corps of Artillerists and Engineers" on May 9, 1794, and another French engineer was named Chief. The Corps consisted of nearly a thousand soldiers, organized into four battalions. When war with France appeared imminent in 1798, the size of the Corps was doubled.[7]

At this time, Secretary of War James McHenry, lamenting the nation's continued dependence on foreign engineers, recommended the

creation of separate branches for the engineers and artillery.[8] He envisioned the engineer corps building "a well-connected series of fortifications," a goal which he called "an object of the highest importance to the United States, not only as these will be conducive to the general security, but as a means of lessening the necessity, and, consequently, the expense, of a large military establishment."[9] He then expressed his concept of an engineer corps that would serve the nation not only in a military capacity, but also in civil pursuits as well:[10]

> We must not conclude from these brief observations, that the service of the engineer is limited to constructing, connecting, consolidating, and keeping in repair fortifications. This is but a single branch of their profession, though indeed, a most important one. Their utility extends to almost every department of war, and every description of general officers, besides embracing whatever respects public buildings, roads, bridges, canals, and all such works of a civil nature. I consider it, therefore, of vast consequence to the United States, that it should form in its own bosom, and out of its own native materials, men qualified to place the country in a proper posture of defense, to infuse science into our Army, and give to our fortifications that degree of force, connection and perfection, which can alone counterbalance the superiority of attack over defense.

<u>West Point, Civil Engineering and Nation Building, 1802-1860</u>

With McHenry's rationale in mind, on March 16, 1802, the Congress authorized President Jefferson "to organize and establish a Corps of Engineers . . . [which] shall be stationed at West Point, in the State of New York, and shall constitute a Military Academy [and] . . . the principal engineer . . . shall have the superintendence of the said Military Academy."[11]

In signing the bill, Jefferson hoped to create a national college of science and engineering whose purpose would be to educate engineers not

just for the Army, but also for public service. Although he opposed the idea of a standing army, he believed that the nation needed some sort of defense force and a small body of professionally trained officers. His decision to establish the Corps of Engineers and West Point solved both objectives simultaneously, and was the embodiment of what Samuel Huntington has called America's "technicist" military ideology. Jefferson felt that since an army was needed, it should be as "useful" to the nation as possible, and not just in military ways. He hoped that American soldiers--and in particular the Corps of Engineers--would serve the nation in peaceful pursuits. West Point modelled itself after the best scientific and engineering schools of France, the world's premier technological nation at the time. Based upon Jefferson's vision, West Point became America's best engineering college, and the Corps of Engineers the nation's leading body of scientists and engineers for much of the 19th Century. Born on the same day, and in continuous existence ever since, the evolution of these two institutions--the Corps of Engineers and the US Military Academy--have played major roles in the development of the Army and the nation.[12] The Corps of Engineers maintained responsibility for the Military Academy until 1866, although beginning in 1812, the Academy began providing officers for branches of service other than the Engineers.[13]

In February of 1803, Congress authorized soldiers to enlist in the Corps of Engineers, although the provision was for just 19 soldiers, whose purpose was to serve as demonstration troops at West Point. On April 29, 1812, Congress authorized the Corps to expand to a force of 113 enlisted men and 22 officers. A year later the number was increased

to 135 enlisted men, organized into "a company of bombadiers, sappers and miners." The Corps provided combat engineering support to the field Army and fortified harbors during the War of 1812.[14]

One of the major constraints on the American Army during the War of 1812 was the lack of transportation infrastructure. Based on this experience, Secretary of War John C. Calhoun developed a plan in 1819 that became the basis for the Corps' involvement in civil works. Calhoun had a grand strategic vision of the Corps of Engineers building a nation-wide system of waterways and roads that would serve the dual purpose of opening up the nation for economic development and providing strategic mobility for the armed forces.[15] The nation sorely needed roads, navigable rivers, and protected harbors. Since commerce, defense and transportation were all key and related elements of the nation's national security policy,[16] and since the private sector simply was not able to meet these needs, the Federal Government stepped in.[17]

The General Survey Act of 1824 was the first official federal effort to plan a nation-wide system of internal improvements. Based on Calhoun's plan, the act granted the President authority to utilize the Corps of Engineers to plan and execute the program. This marked the start of the Corps' official involvement in civil works.[18] From this point forward, the Corps' role as the Nation's federal engineering agency and its non-military missions would expand steadily. In addition to its oldest legacy as an organization of combat engineers, the Corps had developed a new culture of nation building. The Corps of Engineers believed that it had a responsibility to use its knowledge to contribute to the overall improvement of the nation and thereby enhance the

common defense. From this humble beginning, the civil side of the Corps became one of the largest and most powerful of the nation's public agencies.[19]

In the decades leading up to the American Civil War, Army engineers explored, surveyed and mapped the American West; surveyed the route of the Chesapeake and Ohio Canal; surveyed and helped build the early railroads; supervised the construction of the National Road, which helped open up the Midwest; surveyed both the Ohio and Mississippi Rivers and improved their navigability; constructed America's first generation of lighthouses (a mission they performed for the Treasury Department beginning in 1831); rebuilt the national capitol after the War of 1812; and developed a detailed hydaulic survey of the Mississippi River that has served as the basis for all subsequent navigation and flood control improvement.[20] During these years, the Corps' attention was devoted mostly to projects of national importance. With the exception of coastal fortification, the bulk of the Army's construction needs during this period were met by the Quartermaster Department. By the time of the Civil War however, the Engineers had taken over responsibility for the construction and maintenance of military roads.[21]

On May 15, 1846, the eve of the Mexican War, Congress authorized the formation of a 100-man company of "sappers, miners and pontoniers," the first engineer troop unit in thirty years.[22] According to historian Russell Weigley, it was during this war that the American Army's two technical arms--Engineers and Artillery--finally came of age, free from their previous dependence on foreigners.[23] The Engineers performed a wide range of missions throughout the war, to include reconnaissance,

mapping, intelligence, construction, and erecting the critical siege batteries at Mexico City. After the war, the engineer company was retained in the Army, and engineer troop units have been part of the Army's force structure ever since.[24]

In summary, the Corps of Engineers was established permanently in 1802 to provide the nation and the Army with a group of officers trained in the art and science of military engineering, especially fortifications. The nation's defense policy was to protect its coasts from invasion so it could concentrate on its own internal development. The strategy was to fortify key harbors and rely primarily on militia units to defend these forts in case of attack. American aversion to and fear of standing armies led to a small army whose power was fragmented among a variety of technical and administrative departments, and geographical commands. In the early 19th Century, the Corps of Engineers became the key actor in planning and implementing American defense strategy. As the nation grappled with its early economic and internal development, it turned to the Corps. Being the nation's only trained engineers, the Corps played a major role in exploring, surveying and building much of America's early infrastructure. Although many Americans did not believe this was a proper role for the federal government, use of the Corps was justified largely on the argument that the nation must develop its interior lines of communication so it could move forces quickly to any point within its borders for purposes of national defense. This infrastructure would serve the dual purpose of enhancing defense as well as expanding and developing the American economy.

In this early 19th Century defense environment, the Corps of Engineers emerged as the most politically powerful and influential element of the Army. It controlled the Military Academy, which not only educated and trained officers for the Army, but was also the nation's top engineering school for much of the 19th Century. The Corps was at the forefront of American strategic and military thought, and also became the nation's leading scientific and technical agency. The Corps' politcal power base extended well beyond the Army. It had a virtual monopoly on technical knowledge that was valued not just by the Department of War, but also by the Congress and American industry.

The Civil War to War With Spain, 1861-1899.

The Engineers' combat role expanded during the Civil War. Technological improvements--from weaponry to railroads--altered the way armies fought, at both the tactical and strategic levels. Rapid bridging and hasty field fortifications were two of the Engineers' biggest and most important roles. According to historian Shelby Foote, "perhaps the one thing that the Civil War contributed really to the art of warfare was field fortifications."[25]

In August 1861, Congress increased the size of the Corps to 55 officers and 600 troops, including the establishment of a four-company battalion. The Corps of Topographical Engineers was also increased from a strength of 36 officers to 48 officers and 100 troops. In addition, these regulars were supplemented in the field by dozens of engineer units from state militias and volunteers.[26]

Engineer officers reached the zenith of their political success

during this war, playing a major command role on both sides. Of the 48 Corps of Engineer officers on active duty just prior to the war, 32 became general officers in the Union Army. Of this number 11 were corps commanders, 5 commanded armies, and 2 became General-in-Chief of the Army. On the Confederate side 3 engineers distinguished themselves greatly--Lee, Johnston and Beauregard.[27]

The Civil War marked a watershed for the Corps. Although an inordinate number of engineers rose to the highest levels of troop command, and a battalion of engineer troops was permanently established as a part of Army force structure, the Corps' relative power began to recede. Warfare had become more complex. Weapons technology began to emerge as a more significant factor in coastal fortifications than the fortifications themselves. With this, the Ordnance Department and the Coastal Artillery gradually came to play a more important role in coastal defense than the Corps of Engineers.

Warfare had also become more mobile. Large armies could move quickly over vast distances to attack deep inside of enemy territory. Slow moving siege warfare focussed on the defense or capture of fixed fortifications was no longer the essence of land warfare. As a result, the Infantry, Cavalry and Field Artillery began to rival and displace the Engineers as the new strategists and elite within the Army. Removal of the Military Academy from the Corps' control in 1866 reflected this trend.

With the Civil War over, Congress authorized the five-company engineer battalion to remain on active duty and established the strength of the Corps at 861 enlisted soldiers and 109 officers.[28] Although the

number of troops authorized would reach a low of 200, the single battalion remained in the force structure.[29]

From the end of the Civil War until the War with Spain, the Corps returned to its traditional peacetime pursuits of coastal fortifications, civil works and scientific inquiry, while the field Army went back to the western frontier to fight the Indians. During this period, while totally isolated from American society and having recently fought a cataclysmic war, many officers of the line began to develop a professional ideology based upon the Prussian system and the writings of Clausewitz. According to Samuel Huntington, the officer corps developed "a distinctive military character" during this period.[30] As a technical bureau, the Corps was not really a part of, or involved with, this changing Army culture.

During the post-Civil War era, the Corps' civil works budget grew by a factor of six. In addition to river and harbor work and the establishment of national parks, work in the nation's capitol also expanded greatly during this period, and much of the infrastructure that exists today was designed and built by the Corps.[31] For example, the Capitol Building, the Washington Monument, the Library of Congress, the Government Printing Office, the State-War-Navy Building (now the Executive Office Building), Fort McNair, the development of Rock Creek Park and the Tidal Basin, are but some of the projects completed by the Corps. The Corps continued this work into the 20th Century with the Pentagon, National Airport, the George Washington Memorial Parkway, and the rebuilding of the White House. Gradually however, this role was taken over by other federal agencies and the city government.[32]

During the 1890s, the Corps was tasked to rebuild many of the Army's coastal fortifications which had been rendered obsolete by modern weapons technology. The Corps designed a new system of low-profile, dispersed batteries built of reinforced concrete, and incorporating the latest guns.[33] Thus, the Corps' most significant involvement and contribution in matters that could be considered purely "military," continued to be constructing defensive fortifications in the East. This was in stark contrast to the field Army, whose major contribution during the same period was offensive actions against the Indians of the western frontier.

Thus, from the Civil War on, the Corps' role as a federal public works agency grew, and its primary focus was on applying science and civil engineering to what were essentially civilian problems. At the same time however, the Army was becoming more professional and focussed on the art and science of war. The Corps and the Army, it appeared, were heading in different philosophical directions.

During the war with Spain, Congress tripled the strength of the Corps to 160 officers and 2,000 enlisted men. The troops were organized into three engineer battalions of four companies each, and proved themselves to be a valuable asset in supporting the expeditionary American Army. In 1902, Congress reduced the engineer enlisted force to 1,282 men, the largest level of engineer troops ever in the peacetime Army.[34]

From Elihu Root Through Eisenhower, 1900-1960

Although victorious, the nation and the military establishment were

shocked by the logistical and administrative difficulties they faced in raising and deploying the forces needed to fight the war with Spain. This fiasco, combined with popular recognition and acceptance of America's new role as a world power, created a political environment in which reformers were able to institute structural change designed to improve the administrative efficiency and professionalism of the Army.[35]

The Root Reforms. In 1903, Secretary of War Elihu Root, with the authorization of Congress, established sweeping reforms that changed the administrative structure of the Army for the first time since 1813. Root's core belief was that the fundamental purpose of the Army was to fight, and that all elements of the Army should therefore be subordinate to a newly created Chief of Staff. Root captured the rising culture of professionalism within the field Army and empowered officers of the line--Infantry, Cavalry and Field Artillery--as the Army's new elite. He also attacked the independence and political power of the technical and administrative bureaus. As a result, the Corps suffered a loss in political stature relative to the line branches. The embodiment of Jeffersonian technicism, the Corps had been the Army's premier branch for a century. Although the Root reforms did not initially break the political power of the technical branches, they elevated the line branches and relegated the bureaus to second-tier status.[36] This forced the Corps into a supporting role and pushed it towards the periphery of the Army.

The Root reforms had two opposite effects on the Corps of Engineers. On the one hand, they lowered the relative prestige and political power of the Corps within the Army. The Corps' primary focus

was on its civil works role, a mission which the new Army elite saw as tangential if not completely unrelated to preparing for and fighting wars. On the other hand, the military role of the Corps and its engineer troops began to draw more attention from line officers who were charged with training and preparing the Army for combat.

Thus, the Corps of Engineers began the 20th Century with a deeply fissured dual identity. Its primary mission and focus was on its expanding civil works role, which put it at the periphery of the mainstream Army. Its combat role of supporting the field Army however, was beginning to increase. Following the Root reforms, engineer officers began to undergo the same professional evolution as officers of the other combat branches. From this point forward, the hybrid nature of the Corps as a public works agency on the one hand, and a combat arm on the other, became more pronounced. Still a bastion of Jeffersonian technicism, the Corps was becoming increasingly professionalized and supportive of the field Army.

Meanwhile the Corps' civil works role continued to grow. In addition to more domestic missions, the Corps played an important role in building the Panama Canal from 1904 to 1914. Once completed, the Corps assumed responsibility for operating and maintaining the Canal.[37]

World War One. WWI marked a watershed in the magnitude and importance of the Corps' combat role. The industrialized nature of the war, and the flood of new military technolgy greatly expanded the size of the engineer force and the number of new roles. Most importantly perhaps, WWI marked the first time that engineer units were integrated into the Army's basic combat formations.[38]

Under the National Defense Act of 1916, engineer troops were reconfigured from three battalions of three companies each to seven engineer regiments and two mounted engineer battalions. A combat engineer regiment of 868 men became an integral part of each division (an "organic" unit), and comprised 3.9 percent of the division force structure. This "regiment" was comprised of six companies and was more a large battalion than a regiment as we think of one today.[39]

Between 1916 and 1918, the Engineers increased from less than two percent of active Army force structure to more than twelve percent. By the end of the war, the Corps consisted of nearly 300,000 men (10,866 officers and 285,000 troops) in the 2.4 million-man US Army.[40] This huge increase in engineer troops was due to several factors. First, the industrialized nature of the war demanded greater logistical support than any previous war. This meant that port and storage facilities, hospitals, railroads, roads, bridges and utility systems were in greater demand than ever before. As the demand for construction was exploding, the Army reassigned responsibility for all construction in the European Theater of Operations from the Quartermaster Corps, which was strained beyond its limits performing its construction mission in the Continental United States, to the Corps of Engineers. Second, the Engineers were assigned responsibility for a number of new technical functions such as gas warfare defense, searchlights, camouflage, forestry operations and quarying. The tendency was for the Army to assign virtually any new technology which did not fit into the purview of an existing branch to the Corps. Even the fledgling Tank Corps was originally assigned as part of the Corps of Engineers.[41] Finally, the vast network of trenches required

unprecedented numbers of engineers to perform the traditional combat engineer roles of sapping, underground mining, emplacing and clearing obstacles, and constructing fortifications.

WWI accellerated and magnified the importance and development of engineer forces. They were integrated into the Army's combat divisions and rapidly expanded from one of the Army's smallest branches to one of its largest. Though they performed traditional combat engineering functions on a larger scale than ever before, the majority of the engineer troop effort was on construcion tasks inherited from the Quartermaster Corps. Thus, while the Engineers had emerged as a large and important branch, its biggest role was construction and logistical support rather than fighting as a combat arm. In addition to its legacies as a combat organization and a nation builder, the Corps had added a third dimension to its culture--logistical support. Henceforth, one of the Corps' biggest and most important roles would be to provide construction services to the Army in order to facilitate the flow of logistics.

The Interwar Period. After WWI, the Army shrank rapidly. Although the Engineers comprised slightly less than four percent of the Army's active force structure during the interwar period, this level was twice as high as it had been before WWI, and more than five times what it had been during the 19th Century. Moreover, the Army retained the organic engineer regiment within each infantry and cavalry division. When the Army revamped its divisional structure from the large "Square" division of WWI to a new and smaller "Triangular" division in 1936, the engineer regiment was restructured to a battalion of 518 men. Under this new structure, the engineers comprised 3.8 percent of the division,

approximately the same ratio as in the square division. It is significant that although construction--as opposed to combat engineering--comprised over two-thirds of the engineer workload in WWI, all construction units were eliminated from the active force structure during the interwar years.[42] This illustrates that although the Corps had been given an important mission, the institutional preference of both the Corps and the Army for the tactical combat role (ie. sappers) made the newly acquired logistical mission something of a stepchild.

During the interwar years, the dual identity of the Corps grew more pronounced. Its largest and most resource-rich mission was civil works, an arena in which the Corps took on major new responsibilities in flood control, hydroelectric power generation, irrigation and navigation.[43] Indeed, civil works was considered "the very core of an Army engineer's domestic peacetime duty."[44] But the Corps also wanted to support the field Army and improve the Engineers' status as a combat arm. In short, the Corps wanted the best of both worlds.

Suggestions by Army Chief of Staff Malin Craig in the late 1930's that the organic engineer battalion be removed from the divisional force structure were strenuously rebutted by the Chief of Engineers. Threats to their divisional force structure from Craig and later challenges by General Leslie McNair "intensified" the "Engineers' own preoccupation with combat engineering."[45] Although the Corps' primary peacetime mission was civil works, it had a "predilection for regarding itself exclusively as a fighting force" and a "tendency to exalt combat over service functions," when it came to supporting the field Army.[46] The Engineers believed that the German *blitzkrieg* victories of 1939 and

1940 demonstrated not only the ascendancy of mobile warfare over the static defenses of WWI, but also "that the engineers are now an elite member of the [combat] team."[47] The Engineers saw the prominent role of the German Army engineers as "sure and final proof of their claim to an enhanced combat role."[48]

World War Two. Regarding its troop units, the Corps entered WWII with a distinct preference for combat engineering over its construction and logistical support roles. This was due in large part to the Army culture which favored the more prestigious tactical combat forces over the relatively mundane service and logistical troops. The realities of the war however, forced the entire Corps to focus more on the latter two roles than it had imagined. In 1941, the President transferred all military construction responsibility within the United States from the Quartermasters to the Corps of Engineers, a mission for which the Corps was well suited by virtue of its civil works organization and experience. This new role, combined with its global troop construction mission, caused the Army to designate the Corps of Engineers as a service branch and assign it to the Army Service Forces. The Chief of Engineers, along with the chiefs of the other technical branches, was subordinated to the Commander of Army Service Forces and lost his direct access to the Army Chief of Staff. This designation did not please the Engineers, who believed that "the Corps of Engineers is an arm, not a service." This blow to the Corps' prestige was softened by the fact that the divisional and corps combat engineer units were assigned to the Army Ground Forces and were still considered a combat arm.[49]

Although engineer troops played an important role in providing

direct combat support to maneuver forces in battle, the biggest role of engineer troops in WWII was providing construction and logistical support, especially in the Pacific Theater of Operations, where construction of forward air and supply bases on remote islands was the key to victory. Moreover, the American Army's style of ground warfare, with the notable exception of General George S. Patton, tended to emphasize firepower over maneuver, which reduced the relative importance of US combat engineers compared to their German counterparts. The American Army in WWII was predominantly a foot-mobile infantry force, as opposed to a mechanized, armored force. Even though many US divisions achieved a degree of tactical mobility through the use of trucks, half tracks and tanks, once enemy contact was made the Army generally fought in a slow, deliberate manner. The concept of combined arms warfare in the American Army primarily involved the integration of artillery fire with infantry maneuver. The other branches were more supplemental to, as opposed to integrated into, the traditional combat arms of Infantry, Artillery and Armor. This was in contrast to the German style of 1939 and 1940 in which the engineers were an integral part of "combined arms" operations, operating closely with the infantry, armor, artillery and close air support forces.[50]

As the Army built up to fight the Second World War, the Engineers expanded in greater proportion than the Army as a whole, just as they had in WWI. From less than 4 percent of Army endstrength in 1940, the Engineers more than doubled to a level of 8.3 percent by 1945.[51] In addition to some of the reasons seen in WWI, there were other factors which explain this growth. First, the Army relearned a crucial lesson of

WWI--that logistical support was the key to victory in the industrialized "American way of war," and that without construction support, the logistical system could not function. Exaccerbating the problem was the war's global geography, which meant that construction and logistical support had to stretch across two oceans and several continents. The Army's demand for construction, as in WWI, meant that most of the engineer growth was in construction forces. Second, the Corps of Engineers assumed responsibility for a number of new roles that were generated by changes in technology. New engineer troop units were formed for pipeline and airfield construction, as well as amphibious warfare, in which the "amphibious engineers" served as assault troops and performed their sapper mission coming over the shore. Finally, the motorization and mechanization of the Army heightened the importance of the combat engineers' role in providing mobility support for maneuver forces, especially the new armor units.[52] For these reasons, the Engineers rose from the eighth largest Army branch to the third largest. By 1945, only the Air Corps at 22.6 percent, and the Infantry at 21.1 percent, were larger.[53] At the strategic, operational and tactical levels of war, the pace of battle in WWII was in large part dictated by the speed at which the Engineers could accomplish their wide array of missions.

In 1943 the Army reorganized the standard triangular infantry division and created the new armor divisions. General Leslie McNair, Commander of the Army Ground Forces and responsible for divisional force structure, believed that the divisions should be as light as possible and that virtually all "support" troops should be located at corps level. If and when maneuver forces needed a particular type of support, they could

request it from corps, without being "encumbered" with it all of the time. He believed that unneeded support units within the division would only reduce the speed and maneuverability of the combat forces. For the most part this was and still is a sound philosophy. Concerning the Engineers however, there is an inherent contradiction as combat engineers actually enhance the mobility of the maneuver forces. McNair wanted to reduce the engineer structure within the division to just a company. Opponents, particularly from the Corps of Engineers and the Armor Branch, believed that more combat engineers, located up front with the maneuver forces, would enhance the speed and maneuverability of the division through more timely and responsive mobility support. They argued for increasing the level of divisional engineer battalions so that each maneuver regiment would have an organic engineer battalion. The two sides reached a compromise by maintaining the structure at one battalion of engineers in the division. The triangular infantry division had a 647-man engineer battalion, which comprised 4.5 percent of the division, and the armor division had a battalion of 693 men, for an engineer composition of 6.3 percent.[54]

The Cold War, Korea and the New Look. When the US Army emerged victorious from WWII, the Engineers came out with a broader focus than they had in 1940. Even after the rapid demobilization, engineer forces were larger and comprised a higher percentage of Army force structure than ever before in peacetime. The biggest mission was providing construction support. The importance of construction in WWII had not been forgotten by either the Army or the Engineers, as it had following WWI. Army planners realized that construction would again play a major

role in any future war. In addition, the Congressionally appropriated military construction mission provided a new and challenging peacetime mission to go along with civil works, which quickly regained its status as the Corps' most resource-rich peacetime role. In short, the Engineers were more closely tied to the Army than ever before in peacetime, but the relationship was heavily oriented towards construction and logistical support, rather than a tactical combat role. Compared to the 19th Century when the Corps was small but close to the Army's essence by virtue of its role in coastal defense, the Corps was now large but not as closely tied to the Army's core mission.

The Cold War brought an unprecedented expansion of the peacetime Army. In the small Army of the interwar years, nearly all the officers in the Corps of Engineers knew each other and spent years learning and perfecting the skills of their trade. This was replaced by a considerably larger and less personal peacetime establishment. The expansion of engineer troop units provided many more opportunities for troop leading assignments than had been possible in the past. Likewise, the growth of higher level staffs and new functional commands began to draw engineer officers away from traditional career paths within the Corps. For the Chief of Engineers, this expansion undermined his ability to manage the selection, socialization and professional development of each officer. It was now mathematically impossible to rotate more than a small percentage of junior engineer officers into civil works assignments. Moreover, many of the young officers had not studied engineering in college, a distinct break with pre-WWII tradition. The Corps was beginning to evolve from an organization of engineer-soldiers and

scientists, to one of soldiers who managed and led engineering activities. Engineer officers were becoming more like other Army officers. The technical expertise, as well as the uniqueness and mystique of the previous 150 years, was beginning to diminish.[55]

Engineer troop strength remained at more than seven percent of active force structure for all but one year between the end of WWII and the start of the Korean War in 1950, a level double that of the inter-war years. A battalion of combat engineers was solidly established as an organic element within the divisional force structure. Unprecedented numbers of construction units were kept in the peacetime force structure to help rebuild countries shattered by war and to help construct American bases around the world to "contain" the Soviet Union. America's policy during the Cold War was to contain Communism. This translated into a defensive military strategy which emphasized forward basing and deployment of troops. During the Korean War, engineer forces comprised nearly nine percent of the Army.[56] As in the two world wars, the Engineers performed a wide array of missions, ranging from the front lines to the ports and airfields in the rear areas.

When combat broke out in Korea, the Army fought with much the same deliberate, fire power-intensive style as in WWII. After the intial war of movement up and down the Korean peninsula had "degenerated into a static war of position," the Army fought with a style "reminiscent of WWI."[57] One historian has noted that "the Korean War was dominated by the infantry and artillery . . . close cooperation between these two arms determined the character and nature of the fighting."[58] To an even greater extent than in WWII, the Army became "accustomed to massive

amounts of firepower" which caused it to focus on "attrition at the expense of maneuver and . . . offensive spirit."[59] For the Engineers, this meant that as in the two world wars, construction was the dominant role, even though countermobility and survivability missions were very important in the static phase of the war.

The Korean War ended in a stalemate, but like the Spanish-American W·· a half century earlier, it generated an external spark which lit a bonfire of public and Congressional support for the Cold War and the kind of professional, combat-ready Army envisioned by Elihu Root.[60] Stung by its unreadiness for the Korean War, the Army entered a new era in which the concept of combat readiness came to dominate its culture and ethos.[61] The old concept of having time to mobilize prior to entering combat no longer applied. The Army believed it must be ready to go fight anywhere in the world at a moments notice.

Following the bitter experience of limited war in Korea, the nation adopted Eisenhower's strategy of Massive Retaliation, which relied primarily on the threat of nuclear weapons to deter aggression. This caused the Army to focus on integrating tactical nuclear weapons into its organization and doctrine. The Army's adoption of the Pentomic Division structure in 1956 reflected a period in which nuclear weapons technology dominated its thinking and planning.[62] The Engineers incorporated atomic demolitions and mines into their repertoire during this era, but for the most part, their focus remained relatively unchanged, with construction still the primary mission.

McNamara, Vietnam, and the Political Decline of the Engineers.

Although President Kennedy continued the policy of containment, he and Secretary of Defense Robert McNamara shifted to a strategy of Flexible Response. This strategy called for a buildup of conventional forces that could credibly deter and respond to meet aggression at any level, from local limited wars to all out nuclear war. According to McNamara, strategic nuclear forces were not a "credible deterrent to the broad range of aggression."[63] To provide more structural and operational flexibility, the Army abandoned the Pentomic Division in 1961 in favor of the "Reorganization Objectives Army Division" (ROAD), a new and technologically improved version of the old triangular division that had served the Army in both WWII and Korea. Helicopters, armored personnel carriers, and more tanks increased the mobility and firepower of the new division. Doctrinally however, the Army revised its warfighting concept to what can best be described as a "most remarkable . . . return to the methods of the past."[64] In addition, the threat of tactical nuclear weapons to massed attacking forces, the long-term focus on the defense of Europe, and the preference for attrition rather than maneuver warfare, led to the Army's increased "confidence in the power of the defense" relative to the offense.[65] Hence, the Engineers' main emphasis continued to be construction, along with survivability and countermobility. As in World Wars One and Two and Korea, most of the engineer troops were construction as opposed to combat engineers.

Although the nation's top strategic priority remained the defense of Central Europe, the Flexible Response strategy was tested by fire in Vietnam. The Army's mix of counterinsurgency and attriton-style

conventional warfare in the distant and undeveloped environment of Southeast Asia demanded enormous engineer support. Like the Pacific Theater of WWII, the Army's primary requirement for its engineers was the construction and maintenance of logistical facilities, airfields and lines of communication. Even the divisional combat engineers focussed most of their attention on the construction of fire bases, forward helicopter landing areas, and roads. Although not insignificant, the Engineers' sapper role was clearly secondary to construction. With the majority of engineer troops in the Reserve Component, and President Johnson's refusal to mobilize the Reserves, the Army found itself critically short of construction capability. The existing infrastructure in South Vietnam was simply inadequate to support the modern, logistics-intensive force that the US was deploying. The sudden urgency of battle in 1965 magnified the problem. To relieve the pressure, the Corps of Engineers' contracting capability was sent to Vietnam where they successfully accomplished much of the work through private contractors, a new concept for construction in a wartime theater of operations. In his history of the conflict, LTG Dave Palmer described the Corps as "the single most important branch in Vietnam."[66]

The orientation and organization of engineer troops remained relatively constant from WWII to the end of the Vietnam War. From 1954 to 1965, the Engineers generally comprised about 7.2 percent of the active force structure. With the buildup in Southeast Asia however, the figure surged to 8.6 percent in 1967 when the Army was at the peak of its Vietnam construction program. Engineer strength remained at nearly 8 percent of active force structure from 1968 to 1975.[67] In addition,

both the ROAD infantry and armor divisions had organic 950-man engineer battalions, which made up 6 percent of division strength.[68]

The Corps of Engineers as a whole however, underwent major structural changes during the 1962 reorganization of the Army. In terms of structure, McNamara finished what Elihu Root had started six decades earlier. He eliminated the autonomy of the technical branches and fully subordinated them to the Army Chief of Staff. For the Corps of Engineers this meant that the training and management of engineer troops, as well as doctrine development and equipment procurement, was taken from the Chief of Engineers and placed under the central control of newly created functional Army commands. Henceforth, engineer troops and officers would be educated, assigned and promoted under the central philosophy of the Chief of Staff, rather than the Chief of Engineers. Setting aside differences in the technical aspects of the branches, an engineer officer would now theoretically be no different than any other Army officer. If not for the Corps' statutory role in civil works and its unique political relationship with Congress, the Chief of Engineers would probably have been dealt the same fate as the chiefs of the other technical branches, who were eliminated entirely.[69]

The result of the 1962 Army reorganization was that the Corps of Engineers was broken up into several smaller pieces and parcelled out to a number of different commands and staff agencies. Although the operational role of the Engineers was essentially the same as it had been since 1941, the political power of the branch, and especially the Chief of Engineers, was at the lowest point in history. The Corps saw this reorganization as a disaster. McNamara had drastically reduced the

autonomy of the Chief of Engineers and eliminated organizational turf which had belonged to the Chief for almost two centuries.

To compound the loss of engineer prestige, the Army officially designated the entire branch--to include the divisional sappers--as "combat support" in 1969. The Chief of Staff, General William C. Westmoreland, justified this status change on the grounds that the overwhelming majority of Corps personnel were involved with construction as opposed to direct combat missions.[70] Not only had the Corps lost most of its autonomy, but the one true bond it had with the Army's combat elite had been severed.

It was from this vantage point of operational importance but political weakness that the Engineers--particularly the sappers--would begin their ascent.

ENDNOTES

1. Letter From the Chief of Engineers to the Secretary of War (Washington: Government Printing Office, 1876), p. 3. Henceforth, this entry will be shortened to Letter.

2. Theodore Ropp, War in the Modern World (NY: MacMillan, 1962), p. 88.

3. Ibid., pp. 90-1.

4. Letter, pp. 4-5.

5. "The Regiments", Army, March 1989, p. 55. Henceforth, this source will be cited as "The Regiments".

6. Letter, p. 6.

7. Ibid., pp. 6-7.

8. Ibid., p. 10.

9. Ibid., p. 11.

10. Ibid., p. 11.

11. Ibid., p. 11.

12. The ideas in this paragraph are a synthesis of: Lenor Fine and Jesse A. Remington, United States Army in World War II, The Technical Services, The Corps of Engineers: Construction in the United States (Washington: GPO, 1972), p. 5; and Russell F. Weigley, History of the United States Army (NY: MacMillan, 1967), pp. 104-6. For a discussion of "technicist ideology," see Samuel P. Huntington, The Soldier and the State: the Theory and Politics of Civil-Military Relations (Cambridge: Harvard University Press, 1957.) It is worth noting that historian Theodore Crackel rejects the idea that Jefferson's principal reason for founding West Point was its value as a national college of science and engineering. Crackel argues that Jefferson's priamry motive was to develop a way to educate loyal Republicans for service as Army officers.

13. Letter, p. 12.

14. "The Regiments," p. 55.

15. Weigley, History, pp. 135-6.

16. Forrest Hill, Roads, Rails and Waterways, The Army Engineers in Early Transportation (Norman: University of Oklahoma Press, 1957),p. 10.

17. Weigley, History, p. 136.

18. Hill, p. 37.

19. For greater elaboration on this topic, see: Hill, Weigley, History; Kenneth R. Stunkel, "Military Scientists of the American West," in Franklin M. Davis and Thomas T. Jones, The US Army Engineers--Fighting Elite (NY: Franklin Watts, 1967); and "The Regiments." See also John J. Lenney, Caste System in the American Army: a Study of the Corps of Engineers and Their West Point System (NY: Greenberg, 1949); and Arthur Maass, Muddy Waters, the Army Engineers and the Nation's Rivers (Cambridge: Harvard University Press, 1951). Although somewhat one-sided against the Corps, these last two books are full of detailed information on the Corps' political-related activities, and are must-reading for anyone seeking a deeper understanding of the Corps' civil roles.

20. "The Regiments," p. 56.

21. Ibid., p. 56.

22. Weigley, History, p. 182.

23. Ibid., p. 185.

24. "The Regiments," p. 56.

25. Quoted in Geoffrey C. Ward, The Civil War (NY: Knopf, 1990), p. 266.

26. "The Regiments," p. 56.

27. This data on the success of engineers in the Civil War is synthesized from: Davis, pp. 73-4; Irving Crump, Our Army Engineers (NY: Dodd, Meade and Co., 1954), p. 112; and Engineer Notes and Queries, Submitted to the Officers of the US Corps of Engineers (New Haven: E. Hayes, 1863), pp. 5-6.

28. "The Regiments," p. 56.

29. This information is synthesized from: Davis, pp. 80-94; "The Regiments," p. 56; and Weigley, History, p. 273.

30. Huntington, The Soldier and the State, pp. 221-9.

31. "The Regiments," p. 56.

32. Ibid., p. 57.

33. Ibid., p. 56.

34. Data summarized from Davis, pp. 80-94 and "The Regiments," p. 56.

35. I learned this principally from from James E. Hewes, From Root McNamara: Army Organization and Administration, 1900-1963 (Washington: GPO, 1975), pp. 3-12; Wallace Earl Walker, Changing Organizational Culture (Knoxville: University of Tennessee Press, 1986), pp. 143-149; and Weigley, History, pp. 312-326.

36. This paragraph on the Root reforms is synthsized from Walker, pp. 143-149, and Weigley, History, pp. 314-316.

37. "The Regiments," p. 56.

38. Blanche D. Coll, et al., United States Army in WWII, The Technical Services, The Corps of Engineers: Troops and Equipment (Washington: GPO, 1958), pp. 10-12.

39. See Coll, pp. 10-12, and "The Regiments."

40. This data and information is synthesized from: Alfred M. Beck, et al., United States Army in WWII, The Technical Services, The Corps of Engineers, The War Against Germany (Washington: GPO, 1985), pp. 3-5; Davis, pp. 105-6; Burr W. Leyson, The Army Engineers in Review (NY: EP Dutton, 1943), pp. 122-3; Weigley, History, pp. 597-600; and US Army Concepts Analysis Agency, Evolution of US Army Force Structure, SAIC 89-1495, Vol. II (Bethesda, MD: 1989, 2v), table entitled "Branch-Active Army Officer and Enlisted Total, p. 1 of 4. Note also that the "Chemical Engineers" were the early forerunners of the Army Chemical Corps.

41. Coll, pp. 10-12; and Annual Report of the Secretary of War, 1918 (Washington: 1918),p. 50.

42. See Weigley, History, p. 599; USA Concepts Analysis Agency, Vol. II, table entitled "Branch-Active Army Officer and Enlisted Total," p. 1 of 4; and Coll, p. 12.

43. "The Regiments," p. 57.

44. General (Retired) Douglas Kinnard, in a review of Jean E. Smith, Lucius D. Clay: an American Life (NY: Henry Holt, 1990), in Parameters, Autumn 1991, pp. 107-109.

45. Coll, p. 574.

46. Ibid., pp. 573-4.

47. Paul Thompson as quoted in Coll, pp. 19-20.

48. Coll, p. 19.

49. For more information on this topic, see Coll, pp. 25-26 and

225-226. The quotation is from a letter written by Colonel Stuart C. Godfrey, Corps of Engineers, as documented in footnote 65, and quoted in Coll, pp. 25-26.

50. See Jonathan M. House, Toward Combined Arms Warfare: A Survey of 20th Century Tactics, Doctrine, and Organization (Fort Leavenworth, KS: Combat Studies Institute, 1984), and Russell F. Weigley, The American Way of War (Bloomington: Indiana University Press, 1973.)

51. These figures are extracted from the following sources: Raleigh B Buzzaird's "Information Furnished COL John R Noyes" entitled "Strength of the Corps of Engineers from 1875 to 31 May 1945", obtained from the Archives at the Chief of Engineers' Center for History, Fort Belvoir, VA; "The Regiments", pp. 55-57; Weigley, History, pp. 596-600; Coll; and USA Concepts Analysis Agency, Volumes I and II.

52. See Coll, Chapters 1 and 10, and previous chapters detailing History, Missions, and Organization.

53. See USA Concepts Analysis Agency, Vol. II, table entitled "Branch-Active Army Officer and Enlisted Total, p. 1 of 4.

54. This information is taken from Coll, pp. 223-227.

55. See Martin Reuss, "Building Yesterday Today, Historical Characteristics and Contemporary Roles of the Engineer Officer" (Fort Belvoir, VA. Corps of Engineers History Center, March 1987.)

56. This data is drawn and synthesized from: Martin Van Kreveld, Fighting Power (Westport, CT: Greenwood, 1982) Table 6.9, p. 55; Buzzaird, "The Regiments," pp.55-57; Weigley, History, pp. 596-600; Coll; and USA Concepts Analysis Agency.

57. Robert A. Doughty, The Evolution of US Army Tactical Doctrine, 1946-76 (Fort Leavenworth, KS: Combat Studies Institute, 1979), p. 7.

58. Ibid., p. 11.

59. Ibid., p. 12.

60. Walker, p. 149.

61. Ibid., p. 149. For a concise summary of the Korean War and its impact upon the Army as an institution, see Weigley, History, pp. 505-26.

62. See Doughty, pp. 12-19.

63. Robert McNamara as quoted in Doughty, p. 21.

64. Doughty, pp. 21-22.

65. Ibid., p. 25.

66. Dave R. Palmer, Summons of the Trumpets (San Rafael, Cal.: Presidio, 1978), p. 87. For more details on the Engineers in Vietnam, see Carroll H. Dunn, Base Development in South Vietnam, 1965-1970 (Washington: GPO, 1972), and Robert R. Ploger, US Army Engineers, 1965-1970 (Washington: GPO, 1974). See also Russell Fuhrman, "E-Force: The Future for Engineers," Unpublished Paper, US Army War College, Carlisle Barracks, PA: 1986, especially pp. 14-15.

67. This data is drawn and synthesized from: "The Regiments," pp. 55-57; Weigley, History, pp. 596-600; Coll; and USA Concepts Analysis Agency.

68. Data on the ROAD Division is from Vernon Pizer, The United States Army (NY: Frederick A. Praeger, 1967), Charts 1 and 3.

69. See Hewes, pp. 299-348, and The History of the US Army Corps of Engineers (Washington: US Army Corps of Engineers, 1986.)

70. Information on the change of status was found in the papers of General Bruce C. Clarke, located in the Archives at the Corps of Engineers History Center, Fort Belvoir, VA.

CHAPTER IV

THE RISE OF SAPPERS IN THE POST-VIETNAM ARMY

When the Army's ground involvement in the Vietnam War ended in 1973, the Engineers were structured, organized and utilized in essentially the same manner as at the end of WWII. There was one combat engineer battalion organic to each division and the majority of the engineer effort was in construction rather than combat engineering. Politically however, the engineer branch had suffered major setbacks with the 1962 reorganization and the 1969 designation as a combat *support* branch, vice a combat arm. Yet by the time Desert Storm was launched in the Persian Gulf, the Engineers had undergone the most significant resturucturing since WWI, and had in large measure reestablished themselves politically. The Engineers had been designated as a combat arm; they were more focussed on combat engineering than on construction; they had achieved a certain degree of success in pushing their combat systems through the procurement process; and most importantly, the divisional engineer structure had been upgraded from a single battalion to a brigade of three battalions. This chapter will describe and analyze the political comeback and restructuring of the Engineers since 1973.

The Effects of Vietnam.

The Vietnam War was a painful and wrenching shock to the US Army. Not only did the Army fail to "win" in Vietnam, it emerged from the

conflict in tatters. Low morale, illegal drug use, racial strife, and a loss of confidence had eroded discipline. Moreover, a decade of war in Vietnam had seriously undermined the capability of Army units in other parts of the world, and the expense of the war had cost the Army a decade's worth of force modernization. According to one observer, the Army's "morale, discipline and battleworthiness" was "lower and worse than at any time in this century and possibly in the history of the United States."[1]

After Vietnam, the Army "faced serious problems of manpower, morale, strategy and leadership," and had entered "a period of searching inquiry, of readjustment and redirection."[2] Vietnam had been a limited war, and was exactly the type of conflict for which limited war theorists had claimed a big role for the Army. Yet, it proved to be a disaster for both the Army and the nation. Vietnam had made the nation generally unwilling to enter any sort of limited war, regardless of the circumstances, unless the Army could win a clean, quick victory. Since limited war had been the Army's newfound *raison d'etre* under Kennedy and McNamara, but for political reasons was no longer a viable stategic option, the Army suffered from a troubling uncertainty of purpose -- both publicly and internally.[3]

External Factors Impacting the Army.

As if the Army did not have enough problems in the wake of Vietnam, a number of key factors in the Army's external operating environment had fundamentally changed.

After a thorough reassessment of American defense policy,

President Nixon had announced his "Guam doctrine" in 1969. Rather than a "2-1/2 war" contingency, America would plan for "1-1/2 wars"--a large, general war in Europe and a minor conflict somewhere else in the world. With one less war to plan for, the size and budget of the US military could be scaled back considerably. Indeed, the size of the active Army was cut in half, from a Vietnam high of almost 1.6 million soldiers in 1968, to less than 800,000 by 1973. The nation's anti-military mood after Vietnam, combined with the Nixon-Kissinger period of Detente with the Soviets, also led to deep cuts in the military budget. As usual after a war, the Army suffered a disproportionately high share of the cuts, and procurement and modernization stagnated.[4]

Second, the Soviet threat in Europe had grown. While the United States was mired in Vietnam, the Red Army had modernized its forces with two new generations of armored vehicles, had restationed five new armored divisions in Europe and had relocated a number of other divisions to positions closer to the inter-German border. In short, the Soviets had apparently gained both qualitative and quantitative superiority over the US Army.[5]

Third, the intense violence and lethality of the 1973 Arab-Israeli War shocked the Army. In less than a month of conventional war, the opposing sides destroyed more tanks and artillery than the US Army had on the ground in West Germany.[6] Improved technology, combined with new tactics, had made warfare far more deadly. Top Army leaders realized that after ten years of focussing on Vietnam, the Army was illprepared--doctrinally, materially and psychologically--for the new realities of the modern conventional battlefield.

Fourth, the Congress assumed a heightened role in analyzing the details of Army force structure. In particular, they were concerned with the proportion of combat troops to support troops, the so called "tooth-to-tail" ratio. Led by Senator Sam Nunn, the Congress passed legislation intended to force the Army to increase its ratio of "shooters" relative to "supporters."[7]

Finally, widespread anti-military sentiment led to the elimination of the draft and adoption of an all-volunteer force. No longer guarenteed a steady flow of quality manpower, the Army was forced to take a long, hard look at itself, and to devise measures to improve its professionalism and image in order to attract quality recruits.

The Army Responds.

Organization theory predicts that failure to accomplish a core mission, or substantial changes in the task environment, will likely cause organizations to innovate.[8] It is no surprise then, that the Army began seeking new ways to accomplish its mission in response to the shock of Vietnam and the newly imposed external constraints.

Most important, the Army decided to get back to what it saw as the fundamentals of its primary purpose--deterring and, if necessary, fighting conventional war. Army Chief of Staff General Creighton Abrams quickly moved to refocus the Army on the armored defense of Europe, increase the Army's combat power within a fixed endstrength, and restructure the Regular Army's relationship with Army Reserve Component forces in such a way that the regulars could not be sent to fight anything but a small, short war without calling up substantial

numbers of reservists. In addition, Abrams called for a revised warfighting doctrine which would enable the Army to deal with the Soviet buildup in Europe and the new technological realities of the conventional battlefield as witnessed in the 1973 Arab-Israeli War. These decisions would have a number of significant effects on the Engineers.

The focus on Europe provided the Army with a preferred mission, one that had given the US Army its greatest and most satisfying victory when it liberated France and crushed the German Army during WWII.[9] It allowed the Army to leave the ambiguity of limited and counterinsurgency warfare in the jungles of Vietnam and to concentrate fully on the type of high intensity conventional warfare which the Army had preferred since the days of General U.S. Grant in the American Civil War.[10] Moreover it contributed significantly to the nation's policy of containment in the most strategically important and potentially dangerous place in the world, Central Europe. Finally, it placed the Army in the center of America's most important alliance, and also legitimized the procurement of high tech weapons which the Army sought.

The decisions to increase the Army's combat power from 13 to 16 divisions, and to rely more heavily on Reserve Component forces, were driven not only by strategy, but also by politics. Strategically, the Army's mission in Europe was not to actually fight the Red Army, but to deter it from attacking. Only if deterrence failed would the Army have to fight. The Army believed it could more effectively deter the Soviets by increasing its combat forces relative to its support forces. The assumption was debatable however, because an Army must have

logistical staying power in order to be a credible fighting machine. On more than one occasion in the 1980s, the Commander in Chief of the US 7th Army, General Glenn K. Otis, stated that construction and other support forces had grown dangerously thin.[11] Politically, the Army was required to comply with Congressional mandates that it increase its tooth-to-tail ratio. This legislation reinforced the desire among combat arms elites that the Army should get back to the fundamentals of soldiering, and caused the Engineers to modify the structure and mission of their construction units so that they could be counted as "combat" rather than "support" forces. Under this change, the Army redesignated its "construction battalions" as "combat heavy battalions" in 1974.

Increasing the number of "combat units" thus served a number of goals while also producing the side benefit of increasing the number of command opportunities available for combat arms officers. General Abrams was determined to "increase the number of active divisions from thirteen to sixteen" by ridding the Army "of every project or activity that does not contribute to the attainment of the required force."[12]

Increased reliance on the Reserve Component was a natural way to accomodate the increase in combat forces within fixed endstrength. Much of the logistical and support force structure was simply transferred from the Active to the Reserve Component, including most of the combat heavy engineer units.[13] The robust infrastructure and host-nation support in Western Europe, compared to that of Third World nations, also reduced the Army's perceived need for Active Component construction forces and reinforced the desire to rely more on the Reserve Components.

This transfer of support forces would also correct what GEN Abrams believed was a major political and strategic failure during Vietnam: the decision by President Johnson not to mobilize the Reserves to fight. Under the Abrams plan, any significant commitment of Active Army forces would necessitate the activation of Reserve Component forces as well. The Army would thus ensure that future presidents would be bound to respect the Clausewitzian Trinity of gaining and maintaining the commitment not only of the Army and the Government, but also of the People, before ever again sending the Army off to fight a tough, sustained, and potentially unpopular war. By the early 1980's, the development of the Total Force was complete. Nearly every combat division now required the Reserve Component to "round them out" upon mobilization, and the Army was almost totally dependent upon the Reserve Component for logistical support at corps level and above.[14]

Army warfighting doctrine was also updated. Called the "Active Defense," the new doctrine was articulated in the 1976 edition of Army Field Manual 100-5, Operations. It was intended to "effect a break with the past--especially the Vietnam War."[15] Its "emphasis on armored warfare, Soviet weapons systems, emerging technology, and US numerical inferiority all reflected its deliberate focus on the defense of NATO Europe."[16] It emphasized that the tank was now "the decisive weapon" in modern ground combat, but that it depended on and must operate as part of "a combined arms team."[17] The revised doctrine also stated that "the US Army must above all else, prepare to win the first battle of the next war," which would be a "come as you are war."[18] It differed from previous doctrinal revisions however, in that it "announced

dramatic doctrinal change without similar changes in organization."[19] In short, the new doctrine "was a deliberate attempt to change the way the US Army thought about and prepared for war."[20]

In Active Defense doctrine, the Engineers were explicitly recognized as an important member of the "combined arms team."[21] Its author, Training and Doctrine Commander General William DePuy, included the Engineers when he solicited input on the Active Defense draft from his combat arms branch school commandants. In July of 1974, he told MG Harold E. Parfitt, the Commandant of the Engineer School, that "treatment of the Engineer aspects are much too thin and I expect some input."[22] This fact highlights two important points: that the Commander of TRADOC, not the Chief of Engineers, now supervised the Commandant of the Engineer School; and the rising importance of the combat engineers in the eyes of the TRADOC Commander -- a year before they were officially designated by the Army Chief of Staff as a combat arm.

Active Defense doctrine reflected the belief that the tank was the most decisive and important weapon in ground combat, and that it must be able to move rapidly at all times, which implicitly emphasized the mobility role of combat engineers. Furthermore, it reflected an admiration of the German Army's approach to armored and combined arms warfare, in which engineers also played a critical role. Finally, the recognition of a "new lethality" on the modern battlefield raised the engineer mission of survivability to a "critical issue."[23] The new doctrine held that the tank "could not survive without assistance from

other members of the combined arms team,"[24] an explicit recognition of the increased importance of the Engineers' combat role.

DePuy purposely chose the Armor School over the Infantry School as the center for developing the new doctrine, because he wanted to "get away from the 2 1/2 mph mentality" of the Infantry.[25] He thought the Infantry School was still "in the hands of light infantrymen [who] didn't understand" the requirements for modern armored warfare.[26]

Given the new lethality of the battlefield and the defense of Europe as the Army's essence, DePuy believed that "the US Army would have to be retrained, starting at the lowest levels and working up."[27] His goal was "to reorient and restructure the whole body of Army doctrine from top to bottom."[28] Additionally, the new doctrine was an important tool by which the Army hoped to articulate and demonstrate the need for new weapons systems which it desired[29] and believed were required after "the cost and preoccupation with the Vietnam War," in which "the Army lost a generation of modernization."[30]

Altogether, these post-Vietnam Army decisons on strategy, structure and doctrine had an enormous impact on the Engineers in a number of areas. First, they raised the relative importance of the combat engineers in combined arms warfare. In so doing, they contributed to the Army's 1975 decision to designate the Engineers as a combat arm as opposed to a combat support branch. As then Chief of Staff General Edward C. Meyer saw it, redesignating the Engineers as a combat arm was a way to shift the engineer focus away from civil works and construction, and towards their close combat role.[31] Second, they led to the redesignation and restructuring of construction forces to

combat heavy forces, and the subsequent transfer of many of these forces out of the Active Component. Finally, they started to shift the focus of engineer forces from primarily construction support to tactical support of maneuver forces. In short, the Engineers responded to the changes taking place in the Army by becoming more combat than construction oriented. Construction, which had been the Engineers' main mission since WWII, was slipping into second place.

Perhaps the greatest implication, however, was that the Engineers, along with the other Army branches, were wrenched out of their traditional way of conceptualizing their combat role. The Army withdrew into itself after Vietnam, and, as it had done during the post-Civil War and the inter-war periods, it intensified its professional warfighting focus. The Engineers, now fully integrated into the Army since the 1962 reorganization, began to focus to an unprecedented degree on their role in combined arms warfare. The Engineers' positive response suggests that the 1962 reorganization in which the Engineers were placed under the same management as the other combat arms branches, may have expedited the rapid absorption of the combined arms concept into the engineer culture. One should be cautious however, not to overestimate the causal effects of this structural change in contributing to the rise of a combat culture within the troop units of the Engineers. Engineers consistently demonstrated a bias for combat engineering as opposed to construction duties, especially during the interwar period when under the control of the Chief of Engineers. The "new" structure and doctrine now legitimized that bias.

Although the Army's Active Defense doctrine served its purposes of breaking from the Vietnam experience, focussing on the armored defense of Europe and reshaping the way the Army looked at modern warfare, the revolution in Army thinking that it sparked soon led to its rejection. One of the major criticisms of Active Defense was that it "placed too much emphasis on the defense at the expense of the offense."[32] Supreme Allied Commander, Europe, General Alexander M. Haig, told General DePuy in 1976 that he "would personally like to see . . . a more explicit reminder that in general, the ultimate purpose of any defense is to regain the initiative by taking the offense."[33] Haig warned that the doctrine "may induce too narrow a focus on defense for its own sake," and that any revisions ought to emphasize "the importance of offensive maneuver . . . ."[34] Among other faults, because the doctrine's "chapter on offensive operations was not as detailed or sophisticated as the chapter on defensive operations," and because it "diluted the idea of the offensive as critical to victory," the Active Defense doctrine ran into serious opposition among Army officers.[35] The doctrine also failed to consider the operational level of war or provide concepts for corps commanders to deal with Soviet follow-on echelons. "With its emphasis on weapons, firepower, and force ratios," the doctrine "seemed to imply an 'attrition strategy' rather than a . . . 'maneuver strategy.'"[36]

The doctrine's emphasis on defense, firepower, and attrition had required the Engineers to focus primarily on their countermobility and survivability missions in executing a complex barrier plan along the borders of the Central Front. Digging multiple series of fighting positions for tanks, building strong points for infantry and armor forces,

and emplacing obstacles to slow and channelize attacking Soviet forces, were the most important engineer requirements. The most significant mobility mission was cutting rough combat trails to enable maneuver forces to rapidly shift from one set of defensive positions to another.[37] In this defensive scenario, it was extremely difficult, but still possible for the Engineers to accomplish their close combat mission organized under the old divisional engineer structure that predated WWII. Slow, cumbersome and extremely awkward, the ad hoc system of supplementing the lone divisional engineer battalion with corps and theater engineer battalions, all under the command of the divisional battalion commander, was barely able to accomplish its mission under Active Defense doctrine.

The Army's change to AirLand Battle doctrine in 1982 however, made the difficult impossible. This was a watershed event for the Army and the Engineers. Rapid, violent, and decisive offensive action was the essence of the new doctrine. AirLand Battle recognized what the Chinese master Sun Tzu wrote more than 2,000 years ago, that "speed is the essence of war."[38] The "ideal defense" was described as a "shield of blows."[39] The new doctrine emphasized initiative, agility, and the synchronization of maneuver and firepower over the entire depth of the battlefield. Maneuver oriented, the doctrine altered the time and space dimensions of the battlefield and called for an offensive spirit.[40] As a result, the Engineers' mobility missions were raised to an entirely new level of importance. To execute AirLand Battle doctrine, maneuver forces would have to be able to rapidly breach both enemy and manmade

obstacles. The old divisional engineer structure could no longer support Army doctrine adequately.

AirLand Battle demanded that the combat engineers be integrated into the essence of the ground maneuver elements. The Engineers were no longer just supplemental forces that assisted the Infantry and Armor. Rather, they had become a critical member of the combined arms team that provided the mobility which was fundamental to making maneuver achievable. Engineers had to be attached as far forward as possible, down to the level of the maneuver company. They had to be able to keep pace with fast moving tanks and armored personnel carriers, able to operate independently from higher engineer headquarters, and capable of rapidly breaching obstacles in stride. In short, the mobility function of combat engineers had become inextricably interwoven into the fabric of maneuver. The Engineers' close combat role was made even more difficult by the Army's force modernization program of the 1980's in which the speed, lethality and range of the heavy maneuver forces was increased dramatically by the fielding of the Abrams Tank and Bradley Fighting Vehicle. Offense-oriented combat engineer equipment was largely neglected, and the Engineers fell further behind.

The same year that AirLand Battle was introduced, the Army also opened operations at the National Training Center (NTC) at Fort Irwin, California. Realistic and extremely demanding, the NTC raised the quality and intensity of combined arms training to a new level. It quickly became clear that the combat engineers were simply unable to execute their piece of AirLand Battle doctrine, which then caused the maneuver units to fail. The problems were numerous. Not only were the

Engineers unable to effectively control their own assets when engaged in decentralized offensive operations, they simply could not keep up with the maneuver forces they were supposed to support. When they finally reached the obstacle, their outdated equipment made breaching operations unacceptably slow and deliberate. In the words of the Engineer School Commandant, the combat engineers had become "the weakest link in the battlefield combined arms team."[41]

The Commandant stated the problem plainly. Although the Engineers must operate "over a larger area in significantly less time," they find themselves "supporting a rapidly modernizing battlefield with a cumbersome WWII organizational architecture and antiquated equipment." In short, "engineer support to the close combat heavy combined arms team is broken."[42]

At the NTC, engineer shortcomings were no longer "papered over" as they had been in the past, and the importance of the Engineers became obvious. A generation of Army officers quickly became educated on the value of combat engineers. In particular the Armor and Infantry branches--whose ability to maneuver was inextricably tied to the Engineers--became strong advocates for the Engineers.

In summary, doctrinal and organizational changes in the post-Vietnam Army caused the value of the combat engineers' mission to rise. This led to changes in the nature, character and focus of the Engineer branch.

Changes in the Engineer Force.

Let us now examine how the Engineers responded to the changes

made by the Army. We will analyze only the most significant changes: the designation of the Engineer branch as a combat arm, the redesignation of construction battalions to "combat heavy battalions", the increased proportion of sappers in the Active Component, the upgrade of the divisional engineer structure from a battalion to a brigade, the improvement of the Engineers in the weapons procurement business, and changes in the character, or organizational culture, of the Engineer Branch.

Combat Arm Designation. As earlier discussed, the roles, missions, and perceptions of the Engineers have changed over the years. During the 18th Century, the Engineers and Artillery were considered "technical support arms." When it took on the civil works role in the 19th Century and became the US Engineer Department as well as the Corps of Engineers, the troops retained their status as an "arm" but the branch as a whole was considered a "technical service." During WWII, the combat engineers were considered a combat arm and were under the control of the Army Ground Forces, but the branch as a whole was seen as a technical service and therefore placed within the Army Service Forces.[43] Under the Army Reorganization Act of July 20 1950, Congress statutorily recognized the Infantry, Armor and Artillery as combat arms, and the Engineers as a technical service.[44] Throughout the 1950's and 60's however, most engineers continued to think of themselves as combat soldiers and their branch as a "full-fledged combat arm."[45]

In 1969 however, the Army revised its policy on branch categories. Under Army Regulation 10-6, the combat arms were classified as the branches "whose officers are directly involved in the conduct of actual

fighting" and included Infantry, Armor, Field Artillery and the new Air Defense Artillery branch. The Corps of Engineers, by virtue of its wide array of technical and support functions, was classified as a combat support branch.[46] Although this decision essentially reaffirmed the classification that had been established in 1950, it made the Engineers unhappy. One engineer general wanted to "get this wrong corrected" and thought it "inconceivable that Air Defense Artillery is included [among the combat arms] and combat engineers are not."[47]

Shortly after the Army's decision, GEN (Ret) Bruce C. Clarke, who served as the unofficial patriarch of the Engineers following his retirement in 1962, learned that the "support" designation caused combat engineer soldiers to be denied the reenlistment bonuses for which infantry, armor and artillery soldiers were eligible. Convinced that this was bad for the Army and the Engineers, Clarke went on a crusade to overturn the decision. He requested the Army Chief of Staff, General William C. Westmoreland, to classify the combat engineers as a "combat arm", and called it "an error to downgrade any member of the team if we expect to win through teamwork."[48] Westmoreland however, turned Clarke down and told him that "the designation of a branch . . . has no relation to its relative importance on the Army team, but rather identifies its primary missions." He concluded that "although engineer elements have served in combat with great distinction over the years . . . after considering all of the Corps of Engineers' missions, I have concluded that the combat support arm designation best depicts its overall role."[49]

Clarke refused to take "no" for an answer. Over the next couple of

years he wrote dozens of letters to key Army officials and gave numerous speeches around the Army. His purpose was to educate the Army on the importance of the Engineers to the combined arms team and the success of the Army, and to enlist support in his effort to redesignate the Engineers as a combat arm.[50] In May 1975, Clarke told the Army Deputy Chief of Staff for Operations (DCSOPS), who happened to be an old friend, that a member of Congress would "place a rider on a military bill to correct this situation" if need be.[51] The DCSOPS informed Clarke that the Army was "staffing" the action and he was "hopeful that we will be able to solve this issue in house." He told Clarke, "I am confident we do not need a rider on any Congressional bill. This is an internal Army matter."[52]

On September 10, 1975, the Army Chief of Staff approved the designation of the Engineers as a combat arm. The Corps of Engineers also retained its designation as a combat support arm and a service.[53] The Chief of Engineers, whose requests on the action had been turned down, thanked Clarke and told him that the victory was being "heralded throughout the Engineer community."[54]

In addition to Clarke, the Engineers also had (then) MG Edward C. "Shy" Meyer to thank. An infantry officer, Meyer had served in key command and staff positions with the US Army Europe from 1973 to 1975, and was therefore at the forefront and heart of the Army's post-Vietnam emphasis on the conventional defense of Europe. Fresh from the field, Meyer was well aware of the importance of the Engineers, and the gap between requirements and capabilities. Meyer said that "as the DCSOPS [Deputy Chief of Staff for Operations] of USAREUR [US Army

Europe] and as the 3rd Division Commander, I became convinced that we had to bring the Engineers back into the Army." He thought there were too many engineer officers "who felt that Rivers and Harbors was truly the way to go."[55]

Meyer arrived in Washington DC in the summer of 1975, a time when "efforts to get the 'combat' tag appended to the Engineers was on the front burner." Assigned as the Army's Assistant Deputy Chief of Staff for Operations (ADCSOPS), he relates that "God put me in the cattle car from Fort Myer with the DCSPER [Deputy Chief of Staff for Personnel] the day he was preparing to recommend against reinstating the Engineers as a combat arm." Meyer turned the DCSPER around by convincing him that it not only "made sense from a tactical viewpoint, but also that psychologically we had to reorient the young engineer officers toward combat."[56]

Designation as a combat arm marked a turning point in the collective psyche of the Engineers. It started a new era in which the top engineer leaders have consciously tried to change the culture and character of the branch by reorienting the officer corps towards their role in combined arms operations. In response to the new combat designation, the Assistant Commandant of the Engineer School told GEN Clarke that "the Engineers are working hard to convince the Army we are a true combat branch."[57]

From Construction to "Combat Heavy". Ever since taking over the troop construction mission from the Quartermaster Corps in WWI, the Engineers have wrestled with the challenge of how best to organize their forces. At the extremes, there have been two options: a single type of

all-round engineer unit that could accomplish both sapper and construction missions; or two distinct types of units, one specialized for combat engineering, and the other for construction. During WWII, the second option was chosen and it remained in effect through Vietnam. Combat engineer battalions were designed, trained and equipped to support frontline forces and to fight as infantry. They were found at divisional and corps level, and have generally been considered "combat" troops, even when the branch as a whole was not officially categorized as a "combat arm." Construction battalions had much more heavy earthmoving equipment than did combat battalions, and were designed to provide more permanent construction in the rear areas. In general, construction troops were not heavily armed, nor were they expected to fight as infantry. Construction troops were part of the Army Service Forces during WWII and have generally been considered as "support" or "service" troops.[58]

While construction units were extremely important to the Army in both World Wars and Korea, the Chief of Engineers proposed in 1962 to abolish the construction battalion and establish in its place "a single, standardized engineer combat battalion that could be aided, when required for heavier work, by a [special] construction equipment company." However, the Army's Combat Developments Command vetoed the Chief's proposal on the grounds that the construction battalion was critical in previous wars and would again be essential in future lengthy wars.[59] Events in Vietnam vindicated the Army's decision as the large number of construction battalions played an important role in the war.

In the early 1970's, the Chief of Engineers once again began

evaluating the role and structure of the construction battalion. After extensive analysis, the Engineers recommended in 1974 that the engineer construction battalion be redesigned so that it could assume both a construction and a full combat role. Under Congressional pressure to improve its "tooth-to-tail ratio", the Army accepted this proposal in 1975 and reorganized the construction battalions as "engineer combat (heavy) battalions." Key to this change was the stipulation that in addition to construction missions, the combat heavy battalions were expected to perform combat engineer missions and to fight as infantry. To accomplish this change in mission, these new battalions were issued additional machine guns (both heavy and medium), grenade launchers, anti-tank weapons, demolition equipment and communications equipment. The conversion of the construction battalions into combat heavy battalions helped reduce the Army to the proportion of support forces that Congress required that year in the Defense Appropriation Authorization Act of 1975. As a result of this change, the bulk of the Army's engineer battalions (with the exception of the topographic battalions and other specialized engineer units) have been classified as combat troops since 1975.[60]

Increase of Sappers in the Active Component. Despite the redesignation of the construction battalions as "combat heavy" forces, the troops who comprise the battalions are still drawn from the construction series of military occupation specialties (MOS), whereas the majority of soldiers in the combat battalions have the 12-series, or combat engineer, MOS. When Army force planners were looking for spaces to reallocate from the Active Component in order to form the

three new divisions desired by GEN Abrams in 1973, and, later, the two light infantry divisions sought by GEN Wickham in 1984, construction troops and combat heavy battalions were seen as prime targets to cut.

With Active Component force structure held constant at 780,000 between 1975 and 1987, engineer strength fell from nearly 62,000 soldiers (7.9 percent of the AC) to 36,000 (4.6 percent), a drop of more than 40 percent, and the lowest level since prior to WWII.[61] Nearly all of the reductions were in construction troops.

From WWII until the Vietnam buildup, combat engineers comprised roughly 35 percent of the AC engineer force. As the demand for construction troops rose during the Vietnam War, the proportion of combat engineers dropped to as low as 25 percent in 1972. Since then however, the percentage of combat engineers in the AC has risen steadily, and by 1978, for the first time since before WWII, there were more combat engineers than construction troops in the AC. From 1972 to 1978 the total AC engineer enlisted strength was cut from 53,000 to 37,000 troops, however the number of combat engineers (those with the 12 series MOS) increased from 13,000 to more than 21,000. Since 1978, combat engineers have comprised approximately 60 percent of the AC engineer force. Thus while the total AC engineer force declined by 16,000 troops, the number of combat engineers increased by more than 8,000. In order for this shift to occur, the Army carved the spaces out of construction forces by either pushing them into the Reserve Component or eliminating them. Between 1975 and 1988, the AC-RC engineer ratio dropped from 48 percent in the AC to just 31 percent.[62]

In short, the Active Component engineer forces have been

significantly restructured since Vietnam. Proportionally, the sappers have more than doubled their presence, while AC construction troops were the major bill-payer.

E-Force and the Engineer Restructure Initiative (ERI). Since WWII, there has been one engineer battalion, commanded by a lieutenant colonel, assigned to each Infantry and Armor division. In 1990, after six years of testing, analysis and discussion, the Army decided that each heavy division will be assigned an engineer brigade, commanded by a colonel and comprised of three sapper battalions, one per maneuver brigade. One effect of this new structure is that engineers are now habitually associated with the same maneuver unit and more fully integrated into all levels of the combined arms team than ever before, with a sapper platoon supporting each maneuver company and a sapper company supporting each maneuver battalion. Moreover since their original integration into divisional force structure in the First World War, the Engineers have almost doubled their organic presence in the division, having expanded from 3.9 percent of the old Square Division to 7.7 percent of the "AirLand Battle Future" heavy division envisioned for the 1990's.[63]

With ERI, engineer officers can now spend nearly an entire career, from second lieutenant to colonel, with combat engineer units inside of a division. Moreover, they will be competitive with field artillery and aviation officers for the career enhancing jobs inside the division such as division operations officer and chief of staff, that are prerequisites to becoming a division commander. In short, ERI has enabled the Engineers to join the field Army in a big way, and at a higher and

fundamentally different level. They are more combat oriented than in the past, and have moved into the circle of the Army's most elite branches. Henceforth, an engineer officer can choose to be a pure sapper through the rank of colonel, without having to branch out into nondivisional engineer units or the contracting side of the Corps. This is a major change that raises the Engineers to a political level approaching that of the Field Artillery and Aviation branches.

ERI corrects an organizational deficiency that has existed since WWII. Put simply, a single divisional engineer battalion could not provide the support demanded by the division's maneuver units. To compensate, three or four corps engineer battalions were normally integrated into the division on an "as needed" basis, and a temporary ad hoc combat organization was formed. This violated two principles of war: unity of command and simplicity. In its post-WWII after-action review, the General Board reported that "the division engineer battalion was not adequate to handle all the work normally necessary in the division area," and recommended that "the engineer component of the infantry, armored and airborne divisions be increased to a regiment."[64] Based on personal experience, GEN George S. Patton agreed with the Board's analysis and concluded that the Army should consider "increasing the engineer strength of the division to a full regiment." In other words, Patton advocated ERI in 1945. Concerned with keeping the division from getting too big however, the Army rejected this idea.[65]

Since WWII, the size of mechanized forces, the frontages they cover, and the capabilities of their weapons systems have increased dramatically. Yet, engineer force design continued to predate WWII and

most combat engineer systems had barely improved since 1945. Unlike Aviation or Artillery, whose forces can rapidly project their firepower from a distance, the Engineers must be physically at the point of execution to perform their mission. The outdated organization of engineer forces had made it virtually impossible for maneuver forces to execute AirLand Battle doctrine.[66]

According to the Engineer School Commandant, MG Richard S. Kem, increases in the maneuverability and lethality of Army systems, combined with the tenets of AirLand Battle, had "accentuate[d] the role of the combat engineer . . . the man who converts mobility to maneuverability." Unfortunately, the combat engineers had become "the weakest link in the battlefield combined arms team." The problem, according to Kem, was the organization of divisional engineer forces. The solution was E-Force.[67] Although most engineers agreed with Kem, cynics saw E-Force as an attempt by the Engineers to elevate the prestige and influence of the branch--a "power play to create more engineer commands."[68] Before making a decision, the Army wanted further analysis of the concept.

Over time, test results at the NTC and on REFORGER (Return of Forces to Germany) exercises demonstrated that E-Force improved the command, control and effectiveness of engineer forces and significantly enhanced the ability of maneuver forces to execute AirLand Battle doctrine. Moreover, E-Force gained popularity with maneuver commanders at the NTC who had experienced considerable problems in their ability to rapidly breach obstacles. The following comment from a maneuver commander captures this sentiment: "We have an antiquated,

lethargic capability to conduct in-stride breaching operations. Let's get on with it. We've never had sufficient engineers in the force structure."[69]

The heavy forces maneuver community--Armor and Mechanized Infantry--eventually became advocates for ERI. They were convinced that ERI "puts the right people in the right place at the right time with the equipment to do the job."[70] To reassure doubters that it would not allow an engineer "power play", the Army authorized ERI but with no increases in engineer endstrength. To implement ERI, the Engineers would have to reallocate their resources internally. The billpayer would have to be the engineer forces at the theater and corps levels.

The Army authorized ERI to be implemented in FY 1991. Army leaders obviously like the concept as they reconfigured all of the heavy divisions involved in the Gulf War just prior to the fight. After the war, MG Thomas Rhame, who commanded the First Infantry Division, said, "We need E-Force . . . The brigades need a battalion's worth of engineers, and they also need the planning, supervising, and motivating provided by the battalion headquarters."[71] By all accounts, ERI is seen as a success, and all of the heavy divisions' engineers will be restructured over the next few years.

Procurement "Success": from the "Universal Engineer Tractor " to the "Armored Combat Earthmover" (and Combat Mobility Vehicle). "The pick and shovel had been the symbol of the engineer soldier" since the Revolutionary War. By WWII however, it had become "obvious . . . that manual labor and horsepower were incompatible with the tempo of the new Army." As a result, power equipment in large part replaced hand

tools, and the bulldozer replaced the pick and shovel as the trademark of the Engineers.[72]

Despite its importance, engineer equipment took a backseat to more lethal combat systems such as planes, tanks and guns. In a wartime argument over budget allocation between the Chief of Engineers and the Army's Director of Production, the Production Director, LTG William S. Knudsen, remarked that "if you had to choose between tanks and shovels, I'm afraid shovels are going to get hurt."[73] This statement is as true today as it was in 1942. In fact a senior Army official, when questioned as to why it had taken the Army so long to buy the M9 Armored Combat Earthmover (ACE) during the 1980s, replied that "Given limited budget resources, do you buy something that can kill the enemy, or something that digs a hole?"[74]

Procurement of engineer troop equipment represents a tiny portion of the Army budget. Even during the Reagan defense buildup of the 1980s, the amount spent on engineer equipment was extremely small. For example, from 1983 to 1987, the Army procured $797 million worth of engineer troop equipment. This was just one percent of the Army's total procurement expenditures for the period, precisely the same percentage as in 1941, and two-tenths of a percent of the total Army budget.[75] If this meager amount was sufficient to provide the Engineers with the quality and quanitity of equipment necessary to perform their mission, it would not be any cause for concern. However, it is generally acknowledged by engineers and maneuver commanders alike--even in the wake of the recent Gulf War--that the engineer equipment on hand is

insufficient to adequately support the Army's AirLand Battle doctrine or keep up with the modern Abrams Tank and Bradley Fighting Vehicle.[76]

In general, engineer equipment is relatively low in volume, low cost, low tech, unglamorous, and nonlethal. As a result, it has traditionally lacked advocacy outside of the engineer community, and has not done well in the procurement system. The best example is the procurement history of the M9 Armored Combat Earthmover, the ACE, which has been the centerpiece of engineer troop procurement for more than a decade. As early as WWII, both engineer and armor officers recognized the need for an armored earthmoving machine that was mobile enough to keep up with tanks on the battlefied. A tank with a mounted dozer blade offered protection and was fast, but it lacked serious earthmoving capability. The bulldozer on the other hand, was a great earthmoving machine, but failed to protect the operator from small arms fire and shell fragments, and lacked cross country mobility. With the development of armored and combined arms warfare, the need for such a vehicle continued to grow. Yet the Engineers could not convince the Army to buy the ACE until 1982.[77]

Part of the ACE's problem is the fact that engineer systems are simply a small item in the larger scheme of Defense and Army procurement. For a sense of perspective, consider the ACE in comparison to the Abrams Tank and the Bradley Fighting Vehicle (BFV), the primary vehicles which the ACE supports on the battlefield. Not only was the volume of ACEs miniscule, the dollar value of the entire ACE program was less than 5 percent that of the BFV and less than 2 percent of the total Abrams program.[78]

TABLE I

PROCUREMENT OF THE CLOSE COMBAT TEAM, 1977-1991
(in billions of dollars)

SYSTEM	NUMBER BOUGHT	TOTAL COST
Abrams Tank	7,961	20.4
Bradley Fighting Vehicle	6,724	9.3
ACE	611	0.38

Source: Ted Nicholas and Rita Rossi, US Weapons Systems Costs, 1990, Tenth Edition, Section 8.

Unlike the big ticket weapons platforms it supports, the ACE is a non-lethal support system which "multiplies" the effectiveness of the Abrams and Bradley. The ACE is a first generation system which had been on the books since the 1950s. It enjoyed little support outside of the engineer community until after the Reagan buildup had peaked and was on its way down. The problem was, ironically, one not of capability or requirement, but of perception. By initially conceiving of it in "engineer" terms and naming it the "Universal Engineer Tractor" (UET) in the 1950s, the Engineers failed to tie the system successfully to the armored and mechanized forces which would be the chief beneficiaries of its capabilities. Only after the Vietnam War, with their new focus on supporting heavy forces in Europe, did the Engineers come up with the name "Armored Combat Earthmover."[79]

The combination of AirLand Battle, the rising importance of mobility to maneuver commanders, and the increased combat orientation of the Engineers during the 1980s, enabled the Engineers to gain

credibility among maneuver commanders. This, in concert with the realistic testing at the NTC, caused support for the ACE to grow, and eventually convinced top Army and DOD officials that the ACE was indeed a valuable combat multiplier.[80]

Yet because the ACE was born as a "Universal Engineer Tactor" as opposed to an "Armored Combat Earthmover," it has never enjoyed the status it deserves. In fact, it has never been categorized as a "combat vehicle." Rather, it has retained its original classification within the Army procurement system under the category of "other support equipment," a catch-all grouping that includes such such diverse items as chemical, quartermaster, medical, and construction equipment. This is not the category in which one would expect to see the centerpiece system of a combat arms branch.[81]

Despite approval of full scale production and the purchase of more than 400 ACEs since 1988,[82] the pace of procurement was so slow that even the Army's elite 24th Infantry Division (Mechanized)--the first US heavy division to hit the ground in Saudi Arabia--did not have the ACE in its inventory when it deployed for the Gulf War. Only by virtue of a special, high priority, rush order did the ACEs arrive in Saudi Arabia just in time to help US forces breach Iraqi defenses.[83] According to the 24th's commander, MG Barry McCaffrey, "the ACE was excellent" and "it kept up," whereas the old D7 bulldozers were "way behind" the maneuver forces they were supposed to be supporting. McCaffrey declared that as a result of the ACE's performance in the Gulf War, "We'll be fighting for lots more of them."[84] Although the importance of close engineer support is now widely appreciated in the armor and intry communities, the

saga of the ACE provides ample testimony to the Engineers' lack of influence in the Army's procurement system.

In contrast however, the Army's new Combat Mobility Vehicle (CMV), an engineer system which is still under development, will be classified as a "tracked combat vehicle" and part of the new "Armored Systems Modernization" program, a family of armored vehicles to be built around the future "Block 3 Tank" chassis. Though the CMV lends itself to a tank chassis whereas the ACE did not, the point is that under this program, the Engineers will "dine at the same procurement table" as the "Big Three." The Engineers will join the Armor, Infantry and Field Artillery in getting a new combat system built around a common tank chassis.[85] Over the past decade, the Engineers have not only gained credibility as a combat arm, they have also learned to play the procurement game more effectively.[86] Although the Armored Systems Modernization program has been put on hold due to post-Cold War budget cuts, it appears that the Engineers today are both more appreciated and more skilled within the procurement business than ever before.

<u>The Engineers' New Combat Culture</u>. Simultaneous with the organizational and doctrinal changes that ocurred during this period, the Engineer leadership also had a strategy to change the culture--or organizational personality--of the Engineers. Starting with the 1962 Army Reorganization, in which the previously autonomous technical services were either integrated into the Army or abolished, the Engineer leadership has consciously tried to increase the branch's relevance and contributions to the Army.

In 1962 the Chief of Engineers, LTG Walter K. Wilson, told his top

people "we're going to play the game by the Army's rules," and that henceforth the Corps of Engineers needed to "show them [the Army] that we are part of it." Wilson "knew one thing . . . we better do all we could to maintain contact with the Army." He instructed his people that "anytime we get any kind of a question or inquiry from the Army, let's give it the real go when we respond . . . I'm not going to have any excuse that I had to be on the Hill working on the civil works program."[87]

Wilson's strategy set the tone for the Engineers' involvement in Vietnam, where the entire Corps--troops and civilians--made a significant contribution to the war effort, especially in the area of logistical and construction support. As the Army's orientation shifted from Vietnam to the conventional defense of Europe, Wilson's strategy was continued, and the Engineer School responded to the Army's requirements by increasing its emphasis on combat engineering.[88] However the historical independence of the Corps, combined with the legacy of three major wars and thirty-plus years during which construction was the main focus, had created a certain degree of institutional inertia.

Engineer officers were traditionally raised within a culture that taught them to see the world through the eyes of an engineer, then apply their engineering knowledge and technical skills to the needs of the Army. When Wilson told young engineers that "the basic requirement for a regular Engineer officer is that he understand the principles of construction and know how to lead men,"[89] he echoed what an earlier Chief of Engineers said more than a century before: "to be a member of the Corps of Engineers . . . was to be a master of heavy construction."[90]

This traditional "engineer mentality" was fine in the past, but it was inadequate to meet the Army's changing needs in the post-Vietnam era.

It was under the leadership of MG Richard S. Kem that the confluence of key changes in the Army--especially AirLand Battle Doctrine, the intense focus on Europe, and the realistic training at the NTC--generated the "critical mass" needed to fundamentally change the organizational culture of the Engineers. When he took over as Commandant of the Engineer School in 1985, Kem's two Army bosses--then LTG Carl Vuono, Commander of the Combined Arms Center, and GEN William Richardson, Commander of the Training and Doctrine Command--"didn't think we [the Engineers] were very effective and we were badly broken and we needed work to be repaired."[91] According to Kem, they expected him "to absolutely ensure the integration of engineers into the Combined Arms Team . . . to focus on AirLand Battle doctrine in all that we do," and do "everything possible to improve the effectiveness of engineers."[92]

Kem quickly realized that the major problem he faced was dealing with an "Engineer mindset" that was not synchronized with the culture of the Infantry and Armor. He described the problem and his solution as follows:[93]

> Engineers have been their own worst enemies because we tell people things are great when, in fact, they aren't great . . . We may provide what we Engineers talk about as great support, but it's in our terms, like five-ton dump trucks, like breaching [minefieds] with bayonets, but it's not [great] in the terms of guys who talk mobility and maneuver . . . because when they talk, they talk about moving out . . . it was apparent to me that we weren't thinking the same . . . Some Engineers think we're okay, but they're defining things in their terms. So what I did was to define it in maneuver terms. And so my focus throughout my time here has been on war

fighting as an integrated part of the Combined Arms team on today's AirLand battlefield.

Kem's strategy was to transform the "Engineer mindset" by changing the culture of the branch. He changed the curriculum and method of instruction at the Engineer School in such a way that the young engineer officer was immersed in the culture of combined arms warfare. Under Kem, the Engineers began thinking and talking in the terms and language of the Armor and Infantry. According to Kem, "when you do that, then Engineers can't support that [maneuver] commander in the terms of how he intends to fight . . . we were not going to be able to do the job they expected of us in real time."[94] Kem's new approach, which highlighted the wide gap between what maneuver commanders expected the Engineers to do, and what the Engineers were actually capable of, set the stage for his bid to fight for scarce manpower and budget resources and to overhaul the combat engineers' archaic organizational structure.

Today, the first and most fundamental requirement for an engineer officer is to think like an armor or infantry officer, and understand the tactics of maneuver warfare. Only with this foundation can the engineer officer then successfully apply his engineering skill and technical ingenuity to effectively support the maneuver commander. Today's engineer officer receives more tactical training and is more thoroughly socialized as a combat arms officer than his predecessors. Moreover he is better able than ever before to articulate how combat engineers can contribute to combined arms warfare. In short, the engineer officer of the 1990s is first and foremost a warrior, who then applies his technical expe[illegible]se to the needs of the combined arms team.

ENDNOTES

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7. John M. Vann, "The Forgotten Forces," Military Review, August 1987, pp. 2-17.

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11. General Glenn K. Otis in remarks to officers of the 18th Engineer Brigade in Karlsruhe, Germany at various times in 1984 and '85.

12. General Creighton Abrams as quoted in Paul H. Herbert, Deciding What Has to Be Done: General William E. DePuy and the 1976 Edition of FM 100-5, Operations (Fort Leavenworth, KS: Combat Studies Insititute, 1988), p. 25.

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15. Herbert, pp. 7, 99.

16. Ibid., p. 9.

17. Ibid., p. 7.

18. Doughty, p. 41.

19. Herbert, p. 7.

20. Ibid., p. 9.

21. Ibid., pp. 49-50.

22. Letter From General W.E. DePuy, CG TRADOC, to multiple addresses, 23 July 1974, as taken from John L. Romjue, From Active Defense to AirLand Battle: The Development of Army doctrine 1973-1982 (Fort Monroe, VA: US Army Training and Doctrine Command, Historical Office, 1984), p. 80.

23. Herbert, p. 31.

24. Doughty, p. 41.

25. DePuy as quoted in Herbert, p. 41.

26. DePuy as quoted in Herbert, p. 41.

27. Herbert, p. 35.

28. DePuy as quoted in Herbert, p. 36.

29. Herbert, p. 77.

30. DePuy as quoted in Doughty, p. 41.

31. Letter from General Edward C. Meyer to General (Retired) Bruce C. Clarke, 5 April 1978. Letter obtained from the "Clarke Papers" at the Chief of Engineers' Historical Office, Fort Belvoir, VA.

32. Herbert, p. 96.

33. General Alexander M. Haig as quoted in Herbert, p. 96.

34. Haig as quoted in Herbert, pp. 96-7.

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47. Letter, Johnson to Clarke.

48. Letter, GEN Clarke to GEN Westmoreland, January 4 1972, from Clarke Papers.

49. Letter, GEN Westmoreland to GEN Clarke, March 1 1972, from Clarke Papers.

50. See the Clarke Papers.

51. Letter, Clarke to LTG Donald H. Cowles, Army Deputy Chief of Staff for Operations, May 12 1975, from Clarke Papers.

52. Letter, Cowles to Clarke, June 10, 1975, from Clarke Papers.

53. Department of the Army Message, September 10 1975.

54. Letter, LTG W.C. Gribble, Chief of Engineers, to GEN Clarke, September 12 1975, from Clarke Papers.

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56. Ibid.

57. Letter, BG Charles Fiala, Assistant Commandant of the Engineer School, to GEN Clarke, April 11 1978, from Clarke Papers.

58. See Coll for background during WWI and WWII. The remainder of the analysis is based on my general knowledge as an engineer officer.

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67. Kem et al., "E-Force."

68. Interview with anonymous source.

69. Engineer Force Assessment, Report Documentation page and p. 45.

70. Sean D. Naylor, "Structural Engineering", Army Times, September 9 1991, p. 25.

71. Ibid.

72. Coll, pp. 29, 575.

73. LTG William S. Knudsen as quoted in Coll, p. 180.

74. Anonymous Interview.

75. Figures calculated from: Office of the Comptroller of the Department of Defense, National Defense Budget Estimates for FY 92 (Washington DC: March 1991), Table 6-22, p. 130; Assistant Secretary of the Army for Financial Management, The Army Budget, FY 92/93 President's Budget, April 1991 and The Army Budget, FY 1991 Budget Estimate , March 1990; Comptroller of the Army, The Army Budget, FY 1988-89, January 1987; Association of the US Army, Fact Sheet, The Army Budget for Fiscal Years 1992 and 1993, an Analysis, May, 1991; Association of the US Army, Fact Sheet, the FY 1991 Army Budget, an Analysis, May 1990; Association of the US Army, Fact Sheet, The FY 1990-1991 Ammended Army Budget, June 1989; Association of the US Army, Fact Sheet, The FY 1989 Amended Army Budget, no date; Association of the US Army, Fact Sheet, The FY 1988 and FY 1989 Army Budget, no date; Association of the US Army, Fact Sheet, The FY 1987 Defense Budget, April 1986; Association of the US Army, Fact Sheet, The 1985 Defense Budget, no date; Association of the US Army, Fact Sheet, The 1983 Defense Budget, March 1982; Association of the US Army, Special Report, The FY 1981 Defense Budget, March 1980. Figures do not include mines, as they are considered "ammunition" as opposed to "equipment." Basis for comparison with 1941 engineer troop procurement figure is from Coll, p. 94.

76. Recent information on engineer equipment performance in the Gulf War is based on numerous conversations with engineer and armor officers who were in the war, as well as a talk by LTG Henry Hatch at West Point in April 1991.

77. This information is based upon knowledge gained over the years through many conversations, interviews, talks, bulletins and articles, as well as Ted Nicholas and Rita Rossi, US Weapon Systems Costs, Tenth Edition, Section 8.

78. Nicholas and Rossi, Section 8.

79. Based on numerous discussions, interviews and conversations with a number of people, but especially Mr. William Browder of the Army Materiel Command; BG Roger Yankoupe, former Assistant Commandant of the Engineer School; MG Paul Cerjan, an engineer officer and former Commandant of the Army War College; and LTG(R) Max Noah, former commandant of the Engineer School and Comptroller of the Army.

80. Based on numerous interviews and conversations, but especially BG Roger Yankoupe, MG Paul Cerjan, and LTG(Ret.) Max Noah.

81. Interview with Mr. William Browder. See also various budget data sources listed in endnote number 75 above.

82. Nicholas and Rossi, Section 8.

83. Based on talks presented by MG Barry McCaffrey and 1LT York of the 24th Infantry Division, at West Point, NY in April 1991. During the same talk, MG McCaffrey also exclaimed, "Thank God!" that the mine rakes, plows and rollers were delivered "at the last minute."

84. MG Barry McCaffrey in talk at West Point, NY in April, 1991.

85. See for example Sean D. Naylor, "Over the Top," Army Times, October 21,1991, pp. D3-D5.

86. Based on talks by BG Yankoupe, Assistant Commandant of the Engineer School (January 1990); LTG Henry Hatch, Chief of Engineers (April 1990); and LTC(P) Jeff Wagonhurst, Engineer Branch Chief (May 1990) at West Point, and numerous informal conversations with a wide variety of Army officers.

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92. Ibid., pp. 3-4.

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CHAPTER V

BEYOND THE COLD WAR: IMPLICATIONS FOR THE FUTURE

The Engineers' shift in force structure and culture since Vietnam was driven in large part by the Army's focus on the armored defense of Europe. With the end of the Cold War and disintegration of the Soviet Union however, one might ask whether the structural and cultural shift from construction to combat engineering leaves an imbalanced force that is poorly suited for the post-Cold War security environment, in which regional contingencies and peacetime engagement have taken on heightened importance. This chapter will examine the new strategic environment and analyze the suitability of the future Engineer force to support the Army in executing the nation's military strategy in the new world order.

National Security and the New World Order.

In the latest National Security Strategy of the United States (August 1991), President Bush placed increased emphasis on such non-military issues as illicit drugs, economic growth, and the environment. He acknowledged that with the end of the Cold War, "the specific challenges facing our military in the 1990s and beyond will be different from those that have dominated our thinking for the past 40 years." As the threat of global war with the Soviet Union and a massive attack on Western Europe have receded, "the need to support a smaller but still crucial forward presence and to deal with regional

contingencies . . . will shape how we organize, equip, train, deploy and employ our Active and Reserve [Component] forces." Bush argued that "in the aftermath of the Cold War . . . the enemy we face" may be "instability itself."[1]

Through forward presence, it is hoped that US military forces will deter aggression and promote stability. Nevertheless, should deterrence fail, the United States must be prepared to respond with force. Since regional crises have become "the predominant military threat we will face in the future, their demands . . . will be the primary determinants of the size and structure of our future forces." Bush said that "In this new era . . . the ability to project our power will underpin our strategy more than ever. We must be able to deploy substantial forces and sustain them" in less developed parts of the world "where adequate bases may not be available . . . and where there is a less developed industrial base and infrastructure to support our forces once they have arrived."[2]

Under the new strategy, the preference is to respond to regional contingencies "with units--combat and support--drawn wholly from the Active Component." In the event of an "extended confrontation" or an "especially large or protracted deployment," Reserve Component forces will support and sustain a "smaller, more self-contained and very ready Active force."[3]

Based upon President Bush's guidance, General Colin Powell, Chairman of the Joint Chiefs of Staff, has developed The National Military Strategy For The 1990s. Powell states that "the fundamental role of America's armed forces will remain constant: to deter war and , should deterrence fail, to defend the nation's vital interests against any

potential foe." On the other hand, it incorporates two significant new elements: a "framework for peacetime engagement" and a "new focus on regional contingencies."[4]

Powell has widened the spectrum of conflict to include peacetime engagement (PE), which he describes as one of the "key directions" of future US strategy. He argues that nation assistance activities "which assist governmental and socioeconomic development," can "build influence and enhance stability." By working "in concert with the needs and desires of host nations," US forces can "help improve a country's capability to carry out public functions and services in response to societal needs." These efforts in turn, "can contribute greatly to promoting the ideals of democracy, reducing the need for military response and enhancing the effectiveness of military forces should deterrence fail." Along with medical and civil affairs activities, construction is an area in which US forces could make significant contributions in PE.

In reorganizing the Army for the post-Cold War era, Chief of Staff General Gordon Sullivan is charged with preparing Army forces to implement General Powell's strategy. In so doing, he must first consider Powell's guidance that "deterrence remains the central motivating and organizing concept guiding US military strategy."[6] In the Army's case moreover, "credible conventional deterrence" relies upon the capabilitiy to "defeat or reverse an adversary's conventional attack."[7] Sullivan has articulated his vision of a smaller, expeditionary Army whose focus will be on mid-intensity regional wars. Strategic mobility will be crucial in

rapidly transporting a trained, ready and lethal Army to any trouble spot on the globe.[8]

Sullivan grants that "while fightng wars is the fundamental purpose of an Army, we have peacetime missions in support of national goals as well." The Army has redefined its continuum of military operations to include peacetime engagement, hostilities short of war and war. Sullivan describes peacetime engagement as "the benign use of military forces."[9] Through PE, the Army hopes to "obviate the need for direct application of US military force by assisting governments to overcome the root causes of instability so as to prevent the instability from ever threatening US interests."[10] Ranging from nation assistance to disaster relief, PE is "designed to either promote stability or lessen the opportunity for situations to become hostile." Although limited by law, PE also includes contributing to the domestic "general welfare" of the United States through such activities as civil works, assisting in the drug war and support to national research and development programs. In hostilities short of war, the Army's role is "to gain control of the situation and restore peace;" and in war itself, the Army will strive "to apply maximum combat power against the enemy center of gravity . . . to destroy the enemy's will to resist."[11]

Having declared a broader purpose for the Army over a wider continuum of conflict, Sullivan calls for a versatile Army that can "cope with a wide range of tasks." He says that "the Army must be prepared to engage in combat and noncombat operations with the appropriate force structures, weapons and doctrines." In structuring the post-Cold War Army, Sullivan believes that "the noncombatant roles the Army performs

in the continuum require no less attention and effort, since they may well suffice to keep conflict from occurring and escalating into war." The versatility Sullivan calls for "can be accomplished only by a force which possesses organizational adaptability."[12]

Given the new world order and the subsequent changes in the nation's security and military strategies, as well as the Army's expanded commitment to peacetime engagement, let us now examine the appropriateness of the Engineers' shift to a narrower combat focus during the post-Vietnam era.

The Engineers and the Post-Cold War Security Environment.

There is little doubt that today's Engineers are structured and organized better than ever to support heavy forces in mid to high intensity conflict. With the Cold War over though, and the Army's broader mission focus, have the Engineers become too narrowly focussed on close combat support at the tactical level?

Although the Army and the Engineers have acknowledged a broader role and the importance of construction forces in contributing to nation assistance and peacetime engagement, the Active Component's focus on combat engineering will continue to narrow and intensify in the foreseeable future.

The Engineer troop units most capable of performing nation assistance construction missions--the combat heavy battalions--will be significantly reduced. The plan is to cut the number of AC combat heavy battalions in half, from 16 in FY 1991, to just 8 by FY 95. Moreover, one of the three line companies in each battalion will be shifted into the

Reserve Component and will be a roundout company, a move which effectively reduces the construction capability of each remaining battalion by a third. Thus the true AC combat heavy strength will be 5 and 1/3 battalions--a 67 percent reduction over five years--compared to a 40 percent reduction in AC engineer spaces and a 31 percent cut in the Active Army. During the same period, the number of RC combat heavy battalions will be reduced by 25 percent, from 36 to 27 battalions. The 8 round out companies however, will make the total RC combat heavy force 29 and 2/3 battalions.[13] The net effect is that the Army will become even more dependent on the RC for construction forces. The table below depicts the change.

TABLE II

DECREASE IN COMBAT HEAVY BATTALIONS, FY 91 vs. FY 95

	FY 91	FY 95*	Percent Change
Active Component	16.0	5.3	-67.0
Reserve Component	36.0	29.7	-18.0
Total (AC+RC)	52.0	35.0	-33.0

*Note: the FY 95 figures reflect the 8 RC roundout companies.

Sources: Data taken from "Engineer Force Structure, FY 91 vs FY 95" and "Total Army Analysis (TAA) 1999" briefing slides in "Force Development Branch Briefing Agenda" dated 5 December 1991, and obtained from the US Army Engineer School.

Next to the combat heavy battalion, the corps (wheeled) combat battalion is the second most construction-capable type of engineer battalion. In the Engineers' effort to improve close combat support however, these units have been replaced by corps (mechanized) combat

battalions, whose squad vehicle is the M113 Armored Personnel Carrier, as opposed to the 5-ton dump truck. AC corps (wheeled) combat battalions will be cut drastically, as depicted in the table below.[14]

TABLE III

DECREASE IN CORPS (WHEELED) COMBAT BATTALIONS, FY 91 vs. FY 95

	FY 91	FY 95	Percent Change
Active Component	9	0	$-\infty$
Reserve Component	46	12	-74
Total (AC+RC)	55	12	-78

Sources: Data taken from "Engineer Force Structure, FY 91 vs FY 95" and "Total Army Analysis (TAA) 1999" briefing slides in "Force Development Branch Briefing Agenda" dated 5 December 1991, and obtained from the US Army Engineer School.

As the figures demonstrate, the percentage reduction in AC construction capability far exceeds the 31 percent force cut for the Active Army as it moves from 780,000 to 535,000. The only positive change will be in the number of "combat support equipment companies" (CSEs). Structured for earthmoving missions, the number of Active Component CSEs will increase from 6 to 7, and the number of Reserve Component CSEs will double from 15 to 30.[15] This will not nearly compensate however, for the larger cuts described above.

From Fiscal Year 1991 to FY95, AC engineer spaces will be cut from 40,000 to 24,000, a reduction of 40 percent; and RC spaces will be cut by 32 percent, from nearly 90,000 to 61,000. In keeping with their post-Vietnam organizational strategy, the Engineers will protect

divisional force structure (pure "combat engineers") at the expense of theater army force structure (mostly "construction" units) and corps force structure (a mix of both "construction" and "combat" units.) While AC divisional spaces will be cut by just 6 percent, AC corps spaces will be sliced by 55 percent, and AC "echelons above corps" (EAC) spaces will decline by 60 percent. Although the overall engineer AC-RC mix will remain fairly constant at 28:72, the EAC ratio will plummet to 13:87.[16] Due to the Engineer Restructure Initiative on the other hand, the number of divisional combat battalions will increase even as the number of Army divisions is reduced by a third and the total number of AC engineer battalions falls from 52 to 41 (a 21 percent reduction.)[17]

Under the new doctrinal concept of AirLand Operations, the Engineers will be "focussed on forward combat." The goal is for troop units to engage in construction tasks "only when host nation and contract construction are not practicable." This philosophy is in part responsible for driving the AC construction force structure down, and in part a response to the realities of that force structure.[18] Despite the focus on close combat, the branch acknowledges that something must be done to "enhance sustainment engineering . . . and nation assistance activities."[19]

Clearly, the Engineers are resourcing principally those forces needed to accomplish what General Sullivan calls "the Army's fundamental purpose . . . to deter war and if deterrence fails, to gain victory on the battlefield." It is not clear however, that the Army or the Engineers are adequately resourcing the construction forces which may be crucial for sustaining combat operations in remote and

under-developed theaters of operation. Moreover, it is construction forces which will be most useful in performing nation assistance missions, which General Sullivan says "require the same level of professional execution as demanded in a hostile environment."[20]

In short, the Engineers will focus even more narrowly on divisional combat engineering at the expense of construction capability. The return to their sapper roots will intensify even as the importance of construction forces in both regional wars and peacetime engagement missions grows steadily during the post-Cold War era.

Does the Army Need More Construction Forces?

Given that the principal purpose of the Army is to deter and if neccesary win the nation's wars, everything the Army does and the forces it procures should contribute to that purpose. As one of the Army's basic branches, it follows that the Engineers should also be designed for this purpose.

The essence of land warfare revolves around the maneuver arms--the Infantry and Armor. The sapper missions of mobility, countermobility and survivability directly affect the tactical ability of infantry and armor forces to accomplish their missions at the point of contact with the enemy. Synchronization and close coordination between sappers and the maneuver arms is crucial. By increasing the number and organizational presence of organic engineer battalions in the division, the Engineer Restructure Initiative fixes an organizational design flaw that has plagued the Army since WWII. The Engineers and the Army were

wise to implement this change, as it will contribute to the Army's warfighting capability and hence deterrence.

Construction capability, on the other hand, may also be crucial to the Army's success. Adequate infrastructure such as ports, airfields, roads and supply facilities are a prerequisite for the abundant logistical support which is the lifeblood of the US Army. Without adequate infrastructure, logistical support will be constrained, which could lead directly to mission failure. Depending upon the situation however, US construction forces may or may not be required in large numbers for the Army to accomplish its mission. The scope, intensity and location of the war, combined with the level and quality of existing infrastructure and the degree of host-nation support, will determine the level of US construction forces that are required and their relative importance to the success of the mission. Thus the Army has a degree of flexibility in planning for construction support that it does not have in planning for sapper support at the tactical level. Given this flexibility, the Army has decided to accept a certain degree of risk in reducing the level of AC construction forces.

Whereas sappers are integrated into the tactical scheme of maneuver, construction forces work in the rear area and do not normally support maneuver forces directly. Therefore, synchronization and close coordination with combat elements is not crucial in the same sense as it is for divisional sappers. Moreover, because of the direct transferability of construction skills from the civilian sector to the military, Reserve Component soldiers are well suited to perform the construction mission. Operating a piece of construction equipment in the Army differs little

from doing it in civilian life, and building a road or airfield is essentially the same regardless of whether one is working for the Army or a private construction company. After mobilization therefore, RC combat heavy battalions can begin executing their construction mission in relatively short order. There is no comparable transferability of sapper skills.

Given the the reality of scarce AC manpower spaces, and the limited number apportioned to them, the Engineers have wisely allocated most of their AC spaces to the divisional sappers. This gives the sappers, who have the most complex combat tasks and who must closely synchronize with the maneuver forces, the most time to practice and train with the forces they will directly support in combat. In addition to the RC, the Army will also continue to rely heavily on the Corps of Engineers' contract construction capability, as it did in both the Vietnam and Persian Gulf Wars. Going to war with a checkbook is a uniquely American way of providing logistical support while simultaneously economizing on scarce manpower resources.

Given this construct, it is still a fair question to ask whether or not the Army has invested too little of their AC manpower spaces in construction forces. In other words, will 8--or 5.3, depending on how one accounts for the roundout companies--AC combat heavy battalions be enough? Before one can answer this question, one must first ask: "enough construction forces for what purpose?" The nation invests in an Army for its security needs, specifically for deterring and if necessary fighting ground wars. Therefore, construction forces are procured to contribute primarily to this purpose. Nation assistance is important, and

certainly a mission to which construction forces can contribute, however it is their contribution to warfighting which justifies their existence.

Since the Army does not know the timing, location or intensity of its next war, it is impossible to predict accurately how much construction capability might be needed in any given scenario. The operations in Grenada and Panama for example, were relatively small and quick, and therefore did not require much construction. One way to approach the problem is to examine the nation's most recent mid-intensity regional conflicts. Fortunately, Vietnam provides us with a "worst case" construction scenario, and the Persian Gulf War offers a "best case" scenario. By determining the construction requirements in both the best and worst cases, and then comparing them to what will be available to the Army when it has to go to war again, one can draw reasonable conclusions about the adequacy of the Army's troop construction capability.

Persian Gulf War. In a sense, the Persian Gulf War can be seen as a "best case" scenario for construction requirements, as our forces were able to sail unopposed into modern port facilities and land planes at advanced air bases. The logistical infrastructure was already in place to support a massive buildup. Moreover, much of the infrastructure in Saudi Arabia had been built or managed by the contracting side of the Corps of Engineers in previous decades. Thus, a foundation was in place for Corps personnel to return to Saudi Arabia and quickly initiate work through use of the contract and host-nation support.

A total of 40 AC and 25 RC engineer units (both battalions and separate companies) were in theater during the war.[21] Of this total, the

following type units had the capability to perform sustainment engineering missions: 10 combat heavy battalions (9 AC, 1 RC), 7 corps wheeled combat battalions (all AC), 5 combat support equipment companies (2 AC, 3 RC), 3 construction support companies (all RC), and 3 pipeline construction companies (1 AC, 2 RC). However, with the exception of two combat heavy battalions and the six specialized construction companies, most of these assets were sent forward to the corps engineer brigades to perform mobility missions such as building and maintaining roads. Given the limited number of engineers in-theater, and the demand for forward support, this decision was obviously a good one, but it did place consruction capability in the rear area at risk.[22]

Much of the rear area construction was contracted out by the Corps and executed by civilian contractors. However as the January 15th deadline approached, many of the civilian construction workers abandoned their projects and fled to safer areas. This loss of civilian workers, combined with the deliberate decision by the Theater Commander in Chief (CINC) not to deploy more combat heavy battalions to the theater, created a construction shortfall. Although there were no "war-stoppers" and things worked out, after action reports indicate that the theater could have benefitted substantially from four more combat heavy battalions in the rear area. Although the Corps' contract capability played a big role in rear area construction, and in following troop units into Kuwait for post-war recovery operations, observers note that host nation support and contract construction should be used to supplement--not replace--engineer troop units in the theater rear area.[23]

One should note that the shortage of construction units was imposed

not by a lack of force structure, but by Central Command's decision not to deploy more of the combat heavy battalions that were available. Only 9 of the 16 AC combat heavy battalions, and 1 of the 36 RC combat heavy battalions were deployed. Just 7 of the 9 AC corps wheeled combat battalions and none of the 46 RC battalions were deployed. Thus, there was an enormous untapped troop construction capability that could have been deployed to the Gulf had the CINC desired to bring them into theater. This analysis is depicted in Table IV below.

TABLE IV

PERSIAN GULF WAR:
CONSTRUCTION FORCES USED vs. AVAILABLE

Combat Heavy Battalions

	# Used (AC/RC/Total)	# Available (AC/RC/Total)
FY 91 Actual War	9 / 1 / 10	16.0/ 36.0 / 52.0
FY 95 Hypothetical War	?	5.3 / 29.7 / 35.0

Corps (Wheeled) Combat Battalions

	# Used (AC/RC/Total)	# Available (AC/RC/Total)
FY 91-2 Actual War	7 / 0 / 7	9 / 46 / 55
FY 95 Hypothetical War	?	0 / 12 / 12

Sources: Data taken from: "Engineer Force Structure, FY 91 vs FY 95" and "Total Army Analysis (TAA) 1999" briefing slides in "Force Development Branch Briefing Agenda" dated 5 December 1991, and obtained from the US Army Engineer School; and interviews with sources at the Engineer School.

With the drastic cuts in troop construction capability that will occur by FY 1995, the Engineers will have fewer construction forces in the Active Component than were deployed to the Gulf War. Since prudent planning dictates that only a portion of the AC construction battalions be deployed to any one contingency at a particular time (it is wise to keep some forces in reserve for another contingency as well as a training base), the Army will be forced to mobilize and deploy a substantial number of RC forces in order to match the troop construction capability it had in the Gulf War. Thus, even in a "best case" regional war scenario, the Army probably will not be able to accomplish the mission as President Bush had hoped--with units "drawn wholly from the Active Component." (See page 98 above.) On the other hand, if one is willing to rely predominantly on the RC, the smaller Army of FY95 will still have more than twice as much troop construction capability in its Total Force structure (Active and Reserve Components) as it deployed to the Gulf.

However, what if Iraq had attacked further south and siezed the airfields and ports that were available for the buildup and subsequent operations? Certainly, the amount of construction required would have been considerably more, and many of the untapped units would have been deployed. War under this scenario would have led to a slower buildup and a longer conflict. Perhaps two, or even three, times as many construction troops would have been required. Although the Total Army of FY91 had enough construction capability to meet such a large demand, it is uncertain whether the Total Army of FY95 could do so.

Vietnam War. Unlike Saudi Arabia, South Vietnam lacked modern ports, airfields and logistical infrastructure. The country was remote,

underdeveloped and economically backward. In comparison to Saudi Arabia, US construction agencies such as the Corps of Engineers had no significant presence or experience in South Vietnam. To enable a US military buildup, an enormous amount of infrastructure had to be built. Moreover, unlike the quick victory in the Persian Gulf, the Vietnam conflict dragged on inconclusively for many years, which required maintenance of the constructed facilities and infrastructure. For these reasons, Vietnam can be considered a "worst case" for construction planning.

The scope of construction, President Johnson's decision not to mobilize Reserve Component forces, and America's global military commitments during the Cold War, all combined to create a shortfall in construction forces available for rapid deployment to Vietnam. To take up the slack, the contract construction capabilities of both the Army Corps of Engineers and the Naval Civil Engineering Corps were sent to Vietnam, where they contracted out most of the work to private construction firms. According to LTG Carroll H. Dunn, the Director of Construction for the US Military Assistance Command in Vietnam in 1966, "Because engineer troops were few . . . contractors and civilian workmen for the first time in history assumed a major construction role in an active theater of operations."[24] Dunn said that "the requirements for base development were of such magnitude that the contractor force supplied a greater construction capability than the entire military force." The contractors' flexiblity in procuring specialized equipment and personnel enabled them to perform at a greater capacity than the troops.[25] By mid-1966, there were more than 51,000 contractor

personnel performing construction m .sions for the Army in South Vietnam, which was double the number of construction troops.[26] Although the contractors were generally used in more secure areas that were as far as possible from the combat zones, "the absence of a front line made their activities susceptible to interruption by the enemy."[27] It was also quite expensive--approximately two and a half times the cost of equivalent work performed in the United States. The distances, premium wages that had to be paid, and the urgency of the projects all drove the price up.[28]

By the middle of 1967, large numbers of construction engineer forces had been recruited by the Regular Army, trained, and deployed to Vietnam. For the remainder of America's ground involvement, construction troops would outnumber contractor personnel by about two to one.[29] By January of 1968, there were 30,000 US Army engineer soldiers in South Vietnam. Of this number, one-third were combat engineers and nearly two-thirds were construction troops.[30] Except for those engineer units that were organic to divisions or separate maneuver brigades, the Army assigned most of these soldiers to a Theater Engineer Command. The Command consisted of two brigades, and six engineer groups--five of which were construction and one combat. There were 15 construction battalions and 11 corps wheeled combat battalions in the Command, along with a variety of separate companies.[31]

Thus, in the worst case construction scenario for a regional mid-intensity war, the Army deployed 15 construction and 11 corps wheeled combat battalions to Vietnam. The "bad news" is that this

construction force was much larger than what the Army of FY95 will be able to deploy from its Active Component. The "good news" however, is that the Total Army construction capability of FY95 will still exceed the force level deployed to Vietnam. These figures, along with the construction force level in the Persian Gulf, are depicted below.

TABLE V

CONSTRUCTION FORCES IN
VIETNAM, THE PERSIAN GULF, AND FY 95
(number / % Active Component)

	Cbt. Hvy. Bn.	Corps Whl. Bn.	Total
Used in Vietnam	15 / 100% AC	11 / 100	26 / 100
Used in Persian Gulf	10 / 90% AC	7 / 100	17 / 94
Available in FY 95*	35 / 15% AC	12 / 0	47 / 11

* Note: due to the 8 RC roundout companies, I have calculated the 8 AC combat heavy battalions at two-thirds strength, or 5.3 battalions.

Sources: Major General Robert R. Ploger, Vietnam Studies: US Army Engineers, 1965-1970, (Washington DC: Department of the Army, 1974), p. 135; and information derived from various force structure briefing slides obtained from the Army Engineer School as well as interviews with officials at the Engineer School in January 1992.

Future Mid-Intensity Regional Conflicts. Clearly some level of troop construction capability will be needed. As one Desert Storm engineer battalion commander said, "A lot of requirements can be contracted, but many situations occur so fast that Army engineers are the only answer." This is particularly true in many Third World areas, where contracting may not be a viable alternative for accomplishing work rapidly. Even

where host-nation support and contract construction is a viable option, as in Saudi Arabia, it is often the case that "when war is imminent, the local workers, whose personal safety is more important than money, seem to disappear."[32]

If past experiences are applicable, one conclusion appears certain. Unlike the Persian Gulf and Vietnam, where RC construction forces played little or no role respectively, they will play a major role in the next regional mid-intensity conflict. With the equivalent of only 5.3 combat heavy battalions, and no corps wheeled combat battalions in the FY95 Active Component, there is not likely to be any viable alternative for the Army other than to utilize RC forces.

The Army has decided to accept risk in its construction support capability by relying so heavily on the RC. If the best and worst case scenarios of the recent past are indicative of future requirements, the Total Force construction capability projected for FY 1995 might be sufficient, but it might not. Analysis of the Pentagon's recently-released seven hypothetical war scenarios for the 1990s reveal that the worst case construction scenario will be another war in the Persian Gulf, fought simultaneously with a war in Korea.[33] If this worst case scenario were to unfold with the FY 1995 cuts in place, the Army would have slightly more construction capability in its Active and Reserve Components than were utilized in both Vietnam and the Persian Gulf combined. In such a scenario, the Army would be cutting it very close and there would be little or no slack construction capability. If Saddam Hussein were to push further south next time, a shortage of US construction forces could become a critical operational weakness.

Peacetime Engagement and Nation Assistance. Although few people have suggested that more AC construction forces should be procured in order to perform the nation assistance mission, the point is a reasonable one. General Sullivan has said that "the Army must be prepared to engage in combat and noncombat [my emphasis] operations with the appropriate force structures, weapons and doctrines." Moreover he has declared that "the noncombatant roles the Army performs in the continuum require no less attention and effort, since they may well suffice to keep conflict from occurring and escalating into war."[34]

Although 8 combat heavy battalions, particularly if rounded out with the RC company and supplemented with a combat support equipment company, represents a significant construction capability, it is far less than what was available for these missions throughout the Cold War. How then will the Army accomplish its nation assistance mission with just 8 AC combat heavy battalions operating at only two-thirds strength (given that one line company of each battalion will be in the RC) ?

Wherever possible, the responsibility for nation assistance construction missions will go to the Corps of Engineers' contracting side. With its contracting capability, the Corps can accomplish the work while simultaneously helping to develop viable host-nation political and economic institutions. Moreover, should the United States have to send forces to the country for a regional conflict, the Corps will have already established both the governmental and business contacts, as well as the contracting procedures, to enter the area and rapidly begin executing whatever construction is necessary to support deploying US forces.

When a geographical CINC wants to include troop construction

forces in the nation assistance role, RC engineer units can be a good choice, provided that there is an adequate command and control structure to coordinate and manage the continuous flow of RC forces into and out of the area. The deployment and use of these units not only helps accomplish important nation assistance missions, it also provides outstanding "real world" training for the soldiers and familiarizes them with a potential wartime theater of operations. In fact, RC construction forces have performed nation assistance missions in Latin America with great success in recent years. The eight remaining AC combat heavy battalions will also contribute to this mission, depending upon training and mission priorities.

Whether or not the Army should allocate additional AC spaces for more combat heavy battalions comes down to a philosophical question of what the primary purpose of the Army should be. In full agreement with most of the Army's top leadership, Representative Les Aspin, the Chairman of the House Armed Services Committee, argues that "the primary reason Americans want to have military forces is to have the option of fighting when other means fail."[35] Aspin acknowledges that "US military forces . . . have been used for many non-threat related roles, including humanitarian and foreign policy purposes," and that "this will undoubtedly continue in the decade ahead." Given the reality of constrained resources however, Aspin argues that "US military forces should be structured according to the military tasks that Americans want them to perform."[36] In short, Aspin agrees with the Army leadership that peacetime missions such as nation assistance should not be used to justify force structure.

Although important, the peacetime construction roles should be executed with slack manpower resources whose justification in the force structure is their contribution to actual warfighting. Budget realities and scarce manpower resources preclude the justification of additional AC combat heavy battalions for peacetime missions. The Army and the Engineers have quite properly decided to assign the bulk of the nation assistance missions to the contracting side of the Corps of Engineers as well as construction forces from the Reserve Component.

ENDNOTES

1. President George Bush, National Security Strategy of the United States (The White House, August 1991), p. 25.

2. Ibid., pp. 27-29.

3. Ibid., p. 29.

4. General Colin L. Powell, Chairman of the Joint Chiefs of Staff, The National Military Strategy For The 1990s (Draft, October 8, 1991), unnumbered introduction letter and p. 5.

5. Ibid., pp. 8-9.

6. Ibid., p. 5.

7. Ibid., p. 5.

8. General Gordon Sullivan, US Army Chief of Staff, in numerous speeches and articles in Army and Army Times since taking office in the Summer of 1991.

9. US Department of the Army, FM 100-1 (Washington DC, October 1991), p. 7.

10. US Army Training and Doctrine Command, TRADOC Pam 525-5, Airland Operations: a Concept for the Evolution of Airland Battle for the Strategic Army of the 1990s and Beyond (Fort Monroe, VA: August 1991), p. 49.

11. FM 100-1, p. 8.

12. Ibid., p. 12.

13. Data taken from "Engineer Force Structure, FY 91 vs FY 95" and "Total Army Analysis (TAA) 1999" briefing slides in "Force Development Branch Briefing Agenda" dated 5 December 1991, and obtained from the US Army Engineer School.

14. Ibid.

15. Ibid.

16. Information taken from briefing slides entitled "Engineer Force Structure, Total Army Analysis 1999", obtained from the US Army Engineer School in January 1992.

17. Data taken from briefing slides entitled "Engineer Force Structure Comparison", provided by the US Army Engineer School in

January 1992.

18. Engineer Branch Concept for AirLand Operations, 5th Draft (Fort Leonard Wood, MO: US Army Engineer School, January 13, 1992), p. 4.

19. Ibid., p. 26.

20. FM 100-1, p. 18.

21. LTG Henry J. Hatch, "From the Chief of Engineers," Engineer Officer Bulletin, July 1991, p. i.

22. Figures and analysis obtained from sources interviewed at the US Army Engineer School in January 1992.

23. Information derived from: the Engineer School's "Operation Desert Shield/Storm General Observations", and interviews with Engineer School sources during January 1992.

24. Lieutenant General Carroll H. Dunn, Vietnam Studies: Base Development in South Vietnam, 1965-1970 (Washington DC: Department of the Army, 1972), p. v.

25. Ibid., p. 133.

26. Ibid., p.42.

27. Major General Robert R. Ploger, Vietnam Studies: US Army Engineers, 1965-1970 (Washington DC: Department of the Army, 1974), p. 70.

28. Dunn, p. 134.

29. Ibid., p. 42.

30. Ploger, Table 1, pp. 18-21.

31. Ibid., Chart 5, p. 135.

32. LTC Robert H. Griffin, "Pacemakers in Southwest Asia," Engineer Officer Bulletin, July 1991, pp. 13-15.

33. Patrick E. Tyler, "Pentagon Imagines New Enemies to Fight in Post-Cold War Era," NY Times, February 17, 1992, p. A1.

34. FM 100-1, p. 12. For an excellent analysis of this topic, see Allen C. Estes, "The Role of Combat Heavy Engineer Battalions in Nation Assistance," Unpublished Masters Thesis, US Army Command and General Staff College, Fort Leavenworth, KS: 1991.

35. US Representative Les Aspin, Chairman of the House Armed Services Committee, "National Security in the 1990s: Defining a New

Basis for US Military Forces", Before the Atlantic Council of the United States, January 6, 1992, p. 6. In a number of separate and unrelated interviews and discussions, I learned that Aspin's views on at least this particular subject are widely shared. I reach this judgment after hearing the views of a wide variety of "defense officials", ranging from senior Army officers (including a number of engineers), to former Assistant Secretary of Defense Lawrence Korb, and even the senior military analyst on the staff of US Senator Edward M. Kennedy.

36. Aspin, p. 19.

CHAPTER VI

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

After nearly every war, the Army has become smaller and refocussed its vision. Thus, two years after the fall of the Berlin Wall and a year after the liberation of Kuwait, the Army and the Engineers are well along in their plans to restructure forces and focus on new missions that have been brought on by a changed strategic environment.

Summary.

From WWII through the end of the Vietnam War, the Engineers enjoyed a high degree of continuity in structure and mission focus. The majority of the troops were construction specialists and the branch focussed more on providing construction and logistical support than on its close combat sapper role. Technical expertise in civil engineering and construction was valued above all else within the organizational culture of the Engineer officer corps. This orientation best met the needs of the Army and reflected the Army's doctrine and primary missions.

The Army's experience in Vietnam led to fundamental changes in its organizational focus, force structure and doctrine that wrenched the Engineers out of three decades of continuity. A combination of factors in the 1970s and early 1980s--the intensified focus on the armored defense of Europe, the unprecedented lethality of the modern conventional battlefield as seen in the 1973 Arab-Israeli War, greater

reliance on reserve forces, tooth-to-tail ratios, new doctrine, force modernization, and more realistic training--caused the relative importance of the sappers to increase, while at the same time the relative value of Active Component construction forces appeared to decrease.

These factors led to the development of both an internal and external sapper advocacy. Within the Engineers were officers who believed that the structure and culture of the branch needed fundamental revision. Outside of the Engineers, maneuver officers from the Armor and Infantry--the two branches of service that rely most heavily on the close combat support provided by the sappers--became powerful advocates for strengthening divisional combat engineer capability. As a result, from the end of Vietnam to the end of the Cold War, the Engineers have undergone what is arguably their most significant structural and cultural change since WWI, when they were first integrated into divisional force structure and assumed responsibility for the theater of operations construction mission and a host of other technical service roles.

Today's Engineers are different than the Engineers of 1973. In 1974 the Army restructured the construction battalions, increased their combat capability and taskings, and redesignated them as "combat heavy engineer battalions." Most of these battalions were then shifted from the AC into the Reserve Component, which tilted the balance of AC engineer forces from predominantly construction to mostly combat, for the first time since early in WWII. The Army Chief of Staff's 1975 designation of the Engineer Branch as a combat arm was an expression of

the increased importance of the Engineers' combat role in the eyes of the Army. Although the combat support and service support roles were retained, this change in status was designed to reorient the organizational focus of the branch towards its combat role.

The Engineers soon began to employ innovative ways to improve their close combat support. They changed the nomenclature and marketing strategy for a high-speed armored bulldozer which they had unsuccessfully lobbied for since the 1950s. After renaming the "Universal Engineer Tractor" the "M9 Armored Combat Earthmover", and successfully marketing it as a cost effective way to multiply the combat effectiveness of the Abrams Tank and Bradley Fighting Vehicle, the Engineers convinced the Army to procure and field the ACE. Moreover, the Army has included a new Combat Mobility Vehicle as part of the next generation of armored vehicles in the Armor Systems Modernization program, the first time that a dedicated combat engineer vehicle has been included in any plan to modernize armored forces.

The most important change however, is the Engineer Restructure Initiative. Rather than a single combat engineer battalion organic to each heavy division, there is, or soon will be, an engineer brigade of three sapper battalions. This new structure will provide a habitually associated organic sapper platoon to each maneuver company, a sapper company to each maneuver battalion, and a battalion of sappers to each of the division's maneuver brigades. These restructured divisional engineer battalions will be organized and equipped primarily for offensive combat operations and will have very little construction capability. Combined with the large shift of combat heavy and other

non-divisional battalions into the Reserve Component, this means that by FY 1995 there will be 24 Active Component divisional sapper battalions compared to only 6 corps battalions and 11 battalions at echelons above corps.[1] With more than half of the AC engineer battalions organic to maneuver divisions, along with the new divisional engineer brigades, each of which is commanded by a colonel, the Engineers will become increasingly focussed on the divisional sapper mission at all levels, from second lieutenant to colonel. The individual engineer officer's greatest career opportunities will henceforth be with divisional engineer units as opposed to those units in corps or theater level brigades. Moreover, engineer officers will be on virtually an equal footing with aviators and field artillerymen to compete for the senior positions in the division such as operations officer, chief of staff, and even assistant division commander. The result will be that more senior engineer officers will percolate up to key staff positions in corps, theater armies and the Army Headquarters. Greater career opportunities for combat engineers will in turn reinforce the shift to combat engineering which has already occured.

Interwoven throughout the post-Vietnam period was an effort to reorient the branch culture, or personality, towards combat engineering and combined arms warfare. The net result of these structural, organizational and cultural changes is that today's Engineers are a more important member of the combined arms team than ever before and are oriented more towards combat engineering than at any time since prior to WWII. In contrast to the past, an engineer officer today is a warrior first and foremost--a tactically proficient member of the combined arms team. With this foundation, he is then prepared to contribute his

special engineering knowledge in the most beneficial way.

With the end of the Cold War, one might question whether the new sapper-oriented Engineer force best meets the post-Cold War needs of the Army and the nation. The ability to deter and fight mid-intensity regional wars is the new core mission of the Army. As President Bush stated in his 1991 National Security Strategy, the United States prefers to accomplish this mission with forces drawn soley from the Active Component if possible. Certainly the Regular Army would like to be totally be self reliant, but resource constraints have precluded the Army from attaining this goal. Regarding construction, the Army has chosen to rely in large measure on RC construction forces and has therefore accepted a degree of risk in this support function.

As seen in the previous chapter, the FY95 Army will almost certainly have to rely on the RC for most of its construction forces, even in a future best case scenario such as the Persian Gulf War. In the Pentagon's worst case scenario--simultaneous regional conflict in both the Persian Gulf and Korea--even the RC may not have sufficient construction forces to meet the Army's requirements. Moreover, the Engineers' peacetime engagement role will have to be executed primarily through the Corps of Engineers' civilian contracting capability and RC construction forces.

Conclusions.

In a sense, one could argue that the Engineers' new combat focus represents something of a doctrine-structure mismatch in the new security environment. Cynics cite the combat focus as an example of

bureaucratic ambition and a bias for combat forces, when construction forces might have greater utility over the full continuum of operations. Peacetime engagement and nation assistance missions occur frequently, whereas regional wars happen only on rare occasions. Moreover, they point out that these non-combat missions may cure the instability that leads to war. These views have merit, however they mistakenly imply that mission accomplishment in PE will compensate for mission failure in wartime. Moreover, they imply that the Army must choose <u>between</u> sapper and construction forces. Although the Army forced the Engineers to make that choice by mandating that ERI could only be implemented within a fixed Engineer endstrength, the fact is that the Army needs both sapper and construction forces.

As Secretary of War Elihu Root correctly stated nearly a century ago, "the real object of having an Army is to prepare for war."[2] Since Vietnam, the Army has looked to the Engineers primarily for close combat support to the combined arms team in order to accomplish its mission. One Army official acknowledged however, that by placing the priority on sapper support while simultaneously imposing manpower constraints on the Engineers, "we broke the 'echelons above division' system in order to build ERI."[3]

Some skeptics argue that in the post-Cold War era, the Engineers should reconsider the decision to implement the Engineer Restructure Initiative and strive to achieve a more balanced mix of sapper and construction capability in the AC force structure. This criticism implies that ERI was developed only for the purposes of fighting the Red Army in Central Europe. This assumption is simply wrong. ERI fixes a

force structure problem that was recognized by maneuver commanders such as General George S. Patton in WWII. The Engineers were wise to exploit the political momentum generated during the 1980s and to seize the opportunity that enabled them to implement ERI. Moreover, the Engineers have been a major billpayer for force structure changes in the post-Vietnam Army. They understand that in the world of Army politics, the only safe force structure is in those units that are organic to the division.

Construction capability is undeniably important to the success of the Army. However its direct transferability from the civilian world to the Army lends itself well to the Reserve Component. Successful construction units do not require the same exacting standards of sychronization that sapper units must have in order to contribute to combined arms operations. Moreover, AC construction units may be able to meet the Army's demand in all but the most demanding regional conflicts, such as another war in the Persian Gulf or Korea. Smaller operations such as Grenada and Panama required very little construction support. In the larger scenarios, dependence upon the RC would likely force the President to take steps to mobilize public opinion. As the Army learned in Vietnam, maintaining the Clausewitzian Trinity of the Army, the Government and the People can be quite important. Thus, a certain degree of dependence upon the RC is not all bad.

In addition to RC forces, the Army will also depend upon the Corps of Engineers' construction contracting capability. As demonstrated in both the Vietnam and Persian Gulf Wars, this is a viable way for the Army to economize on the number of construction troops needed in a

theater of operations. Moreover, acknowledging an operational wartime role for the civil side of the Corps will draw it closer to the Army, which is healthy for the Corps itself, the Engineer Branch, and the Army.

Some might argue that the Army should procure additional AC construction forces in order to more aggressively execute the construction portion of nation assistance. The Army acknowledges the importance of these non-combat roles and has developed a creative method to resource the mission by utilizing the Total Army--Active and Reserve Component and civilian forces. In an unconstrained resource environment, the Army would undoubtedly procure additional AC construction forces to devote to this mission. Resource constraints however, compel the Army to prioritize its scarce manpower resources. Given the prioritization of mission requirements--with combat capability being at the top, and peacetime engagement not as high--along with the realities of decreasing budgets and manpower levels, I believe the Army and the Engineers have structured the force wisely in this regard.

In conclusion, I believe that given their fundamental mission and the resource constraints imposed upon them by the Army, the Engineers' post-Vietnam sapper focus is sensible. In a sense, the AC Engineers have returned to their original sapper heritage that was established at birth in the Revolutionary War. Newer engineer missions, such as nation assistance and troop construction, have been delegated in large part to other Engineer elements of the Total Army. Although it would be desirable to have more AC combat heavy battalions at full strength for both regional wars and nation assistance, the Engineers have accepted

reality and wisely focussed their very limited number of AC forces on the sapper role.

Recommendations.

Although I believe the Engineers have chosen the proper course, the Army, on the other hand, needs to understand the full implications of cutting both its proportion of AC engineer troops and construction forces to the lowest level since before WWII. Quite simply, lack of construction capability could cause the Army to fail.

By FY95, the Engineers will comprise only 4.5 percent of the Army's 535,000-soldier AC force structure. From WWII through Vietnam however, the Army typically contained from 7 to 8 percent engineers--most of whom were construction troops. I believe that the Army could significantly reduce its risk in regional mid-intensity wars, and meet President Bush's stated goal of using mostly AC forces in regional contingencies, by allocating enough AC manpower spaces for a total of 16 full strength AC combat heavy engineer battalions (compared to the 8 battalions that will be manned at two-thirds strength.) This would allow the Army to deploy 10 combat heavy battalions to a regional war (precisely the number sent to the recent Persian Gulf War), maintain an adequate training base in the United States, and still have a couple battalions kept in reserve for another contingency. These additional 10,000 spaces would raise the percentage of AC engineers to 6.4 percent of the Active Army--still quite low by historical standards.

Furthermore, I recommend that the Army take the following

additional steps to improve its engineer capability. First, it must ensure that across the board, RC forces are ready to mobilize quickly, go to war, and accomplish their mission. Although RC construction forces are technically proficient as engineers, their basic soldier skills are often inadequate to ensure survival on the battlefield.

Second, it should increase the role of the Corps of Engineers' civil side around the world. By utilizing the Corps in peacetime, the Army will further develop the Corps' unique contracting capability, increase the potential of host-nation support in case of war, and contribute to the nation's peacetime engagement mission at the same time.

Third, the Army should resource efforts to develop new technology that will reduce the level of manpower needed to perform both construction and sapper tasks. With few exceptions, the Engineers perform most of their missions in the same manner and with equipment similar to that used by their predecessors in WWII. While Infantry, Armor, Artillery and Aviation forces have exploited quantum leaps in technology, the Engineers--despite all the changes in the post-Vietnam era--still plod along at a relatively slow, deliberate pace. Improved technology could enhance capability while simultaneously reducing manpower requirements.[4]

Finally, the Army should coordinate closely with its sister services to ensure that joint Naval, Air force and Marine construction and sapper capability is exploited to its fullest potential.

ENDNOTES

1. "Engineer Force Structure, Total Army Analysis 1999", briefing slides obtained from the Engineer School, January 1992.

2. Annual Report of the Secretary of War for the Year 1899 (Washington DC: GPO, 1899), p. 47.

3. Anonymous interview.

4. See Gregg F. Martin, "Construction: the Foundation of National Defense," Unpublished Masters Thesis, MIT, Cambridge MA: 1988.

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Abstract of
FROM VIETNAM TO BEYOND THE COLD WAR:
THE EVOLUTION OF U.S. ARMY ENGINEER FORCES, 1973-1991

This study describes and analyzes the evolution of force structure and organizational focus within the troop side of the U.S. Army Corps of Engineers from the end of the Vietnam War through today. The purpose is to understand what changes have taken place, why they occurred, and what the future implications of these changes are in the post-Cold War security environment. The scope of the study is limited primarily to US Army combat and construction engineer forces. From the end of the Vietnam War to the end of the Cold War, the Engineers have changed their force structure and organizational focus from essentially a construction orientation to a predominantly combat engineering, or sapper, focus. From WWII through the end of Vietnam, the Army's major requirement for the Engineers was construction. After Vietnam however, a number of important Army changes caused the relative value of combat engineering to increase, while the perceived need for construction forces dropped. As a result of this changed environment, today's Engineers are better prepared than ever to provide close combat tactical support for maneuver forces, but have lost much of their construction capability, a diminishing operational asset which will play an increasingly important role in both regional wars and peacetime engagement.